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ABSTRACT

This document presents the data gathered by the author when he made an international study tour in 1970. The purpose of the tour was the investigation of planning and management in tertiary education, with particular reference to the cost effectiveness of colleges of higher education in Australia. The tour began with visits to the cities of Singapore and Hong Kong, followed by visits to the U.S.S.R., Switzerland and France, the United Kingdom, Canada, and the U.S.A. The subject areas investigated are: corporate management structures and procedures; financial control and policies; buildings and grounds programs and planning; research and planning; and staffing and personnel. Other general topics were also studied including student affairs and government, organization of the academic year, applied research for industry, relationships among institutions, governments and communities, coordination of tertiary education, and the open university. (HS)

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Planning and Management in Tertiary Education

REPORT ON STUDY TOUR
Cost effectiveness in Colleges of Advanced Education

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PLANNING AND MANAGEMENT IN TERTIARY EDUCATION

A STUDY TOUR: COST EFFECTIVENESS IN COLLEGES OF ADVANCED EDUCATION

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INTRODUCTION

My sincere thanks are expressed to the Commonwealth Department of Education and Science, acting on the advice of the Research Sub-Committee of the Commonwealth Advisory Committee on Advanced Education, and to the Council of the Western Australian Institute of Technology, for the financial grants made to me in respect of an overseas study tour between July and November 1970. The purpose of the tour was the investigation of planning and management in tertiary education, with particular reference to the cost effectiveness of Colleges of Advanced Education in Australia.

Throughout the tour, the utmost co-operation was extended by the many instrumentalities, institutions and individuals with whom an exchange of opinions and information took place. It was noticeable that, despite differences of race and culture, there was a marked similarity in the definition of problems and the answers being sought to these in the immediate future and, indeed, in the next decade. Sincere thanks are extended to all, and the hope is expressed that the report which follows will be of some assistance to all those who gave of their time and ideas so unstintingly.

The tour began with visits to the Asian cities of Singapore and Hong Kong, followed by the U.S.S.R., and then by visits to Switzerland and France (where the emphasis was on discussions with international organisations), the United Kingdom, Canada and the U.S.A. Appendix A to the report gives details of all those with whom discussions were held.

The report which follows does not therefore constitute a detailed briefing on current practice and thinking in the countries visited, but rather constitutes an attempt to record and evaluate the significant ideas garnered as a result of the tour, allied to my experience in a single Australian institution. It incorporates many ideas and proposals which have resulted from a fusion of study tour discussions and my own thinking and experience in an Australian context. The whole report concentrates on recommendations and the reasons therefor, and I have avoided encumbering it with too much data, in the belief that this approach would obscure the essentials.

During the study tour, I made use of a small brochure which gave the background of my position, the Western Australian Institute of Technology and the areas of study. This proved to be valuable and the idea may well be worth consideration by others contemplating a similar study tour.

The report has been written under major subject areas, although it begins with a chapter which endeavours to give an overview and a general summary. One of the most important results of the tour was the establishment of communication with many different individuals and institutions. The resulting written dialogue, coupled with a more detailed reading of a large number of documents could well lead to such further papers and reports, as time and circumstances permit.

The final chapter of the report is a probing look into the future, postulates a few additional theories, and presents a number of ideas in their embryonic form.

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Perth W.A.
1971

The subject areas which were investigated are listed below:

Corporate Management Structure and Procedures including -

* governing body
* executive
* academic policy-making
* decentralisation of authority and responsibility
* major resource allocation methods
* time sequences in decision-making

Financial Control and Policies including -

* financial and physical budgeting and control
* output budgeting and control
* cost analysis techniques
* long-range financial forecasting

Buildings and Grounds Programmes and Planning including -

* educational specifications
* architectural services
* design and construction, including modern methods of campus planning
* long-range capital works programming

Research and planning including -

* enrolment forecasting
* measurement of community needs
* space utilisation, forecasting and scheduling

Staffing and Personnel including -

* establishment measurement
* work study in laboratories and workshops
* staff involvement

General Topics including -

* student affairs and government
* organisation of the academic year
* applied research for industry
* relationships between institutions, governments and communities
* productivity criteria
* co-ordination of tertiary education
* open university

As was probably inevitable, I found it necessary to concentrate on particular subject areas in different locales, for it proved impossible to cover all the areas in each country and/or with each organisation visited. Furthermore, greater emphasis was placed on some subjects rather than attempt a more cursory examination of all the topics listed.

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OVERVIEW

1.1 RISING EXPENDITURE ON EDUCATION

Expenditure on education throughout Australia has been increasing in the last decade at an unprecedented rate. Tables 1 and 2 illustrate the situation in Western Australia.

The upward trend revealed by these tables is by no means exceptional; similar data on other developed nations or regions would show that, significant as has been the growth rate of education expenditure in Western Australia, it remains well below the norm throughout the world. Furthermore, the increase of expenditure on higher education has been rising at a substantially faster rate than has occurred with primary, secondary and technical education.

The expenditure at the Western Australian Institute of Technology in 1967/69 was 13.8 million dollars, whilst projected figures for 1970/72 and 1973/75 are 30.5 million dollars and 80 million dollars respectively. A great deal more research is necessary on:

(a) the decision-making processes and required essential data (whether used at present or not) in making financial allocations to the interlocking strata of education, and

(b) the methods used or capable of being used in the development of national policies and strategies.

Errors at government level, arising from such factors as inadequate data, limited research, failure to project the long-range effect of current decisions and undue weighting of political factors, have caused serious disturbances in the educational system. At one point in time, there is an undue emphasis on higher education, with consequences which include an ill-prepared intake from the secondary system, and an oversupply on the labour market of professionally trained graduates. Sudden reversals of policy, based on the evidence of the moment and not on a rational forecasting of requirements, say over a forthcoming decade, often cause equally serious dislocation not only of the educational system, but also of the economic and social fabric of a nation.

Education is a major industry, and trends suggest it will become the biggest resource consuming industry in the world. Already education is taking the biggest share of many national budgets, displacing defence which for so long has been the major charge against national wealth. In my view, this is as it should be, for education has some degree of permanence for the individual, some positive influence on society and future generations, in contrast to many other expenditures where the impact is small.

The importance of education is being accentuated as Australia, in common with most of the rest of the world, prepares for the advent of the knowledge society. At

Table 1 Western Australian Government Expenditure
Proportions: 1960-61 to 1969-70

	1960-61	1961-62	1962-63	1963-64	1964-65	1965-66	1966-67	1967-68	1968-69	1969-70
EDUCATION	16.6%	17.1%	17.7%	18.3%	18.7%	19.7%	19.4%	21.0%	21.0%	21.9%
HEALTH, HOSPITALS & CHARITIES	14.1%	13.7%	13.6%	14.2%	14.7%	14.4%	14.2%	14.5%	15.2%	15.6%
LAW, ORDER & PUBLIC SAFETY	4.5%	4.4%	4.4%	4.5%	4.7%	4.5%	4.7%	4.8%	5.1%	5.2%
DEVELOPMENT OF STATE RESOURCES	12.9%	13.0%	13.2%	13.7%	12.2%	12.2%	12.7%	12.8%	13.9%	14.2%
TRANSPORT	27.2%	26.2%	24.6%	23.9%	23.4%	22.8%	22.3%	23.1%	21.4%	19.9%
LEGISLATIVE & GENERAL	6.4%	6.9%	6.8%	6.0%	6.6%	7.3%	8.1%	5.9%	6.2%	6.6%
PUBLIC DEBT CHARGES	18.3%	18.7%	19.7%	19.4%	19.7%	19.1%	18.6%	17.9%	17.2%	16.6%
TOTALS	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Source: State Treasury

Table 2 Western Australian Government Expenditure
Percentage increase: 1960-61 to 1969-70

	Percentage Increase 1960-61 to 1969-70
EDUCATION	196%
HEALTH, HOSPITALS & CHARITIES	146%
LAW, ORDER & PUBLIC SAFETY	152%
DEVELOPMENT OF STATE RESOURCES	145%
TRANSPORT	62%
LEGISLATIVE & GENERAL	128%
PUBLIC DEBT CHARGES	101%

Source: State Treasury

the beginning of this century, primary industry was predominant, only to be displaced at a later stage by secondary industry. Both primary and secondary industries benefited from the work of Taylor, called the father of scientific management, who was able to make manual work productive. His weapons were technological and managerial. Today, however, the shift in importance is to the knowledge-oriented industry, examples of which are education and research organisations. Knowledge is the base of society rather than skill and brawn. Peter Drucker has declared that the great task for the rest of this century is to make knowledge industry productive.

It will involve new radical thinking. Autocratic management structures will disappear in favour of flat structures, in which task forces, comprised of people of a variety of abilities, will join together for a limited time to achieve a given objective. There will be inter-disciplinary approaches to the solution of problems. Men will learn from dialogue with each other. There will be more face-to-face discussions, in which talent and knowledge will count, and not seniority and power.

Those in senior management will still need to make the big decisions on policy and budget, but they will diffuse their detailed operational powers throughout the organisation.

Against this background, education assumes even greater importance; yet, whether measured in quantity or quality, all is not well with this emergent premier industry of the world.

1.2 PRODUCTIVITY OF EDUCATION

There is very little evidence to support a theory that productivity in education is improving. Many national and institutional case studies show the contrary, i.e. that productivity is declining. At best, productivity is either remaining constant or improving at a singularly low rate when compared to other major industries. Ironically, the rapidity with which technological knowledge (leading to improved productivity) is growing and its effect on the workaday life of the nation is often advanced as a partial explanation of the growth factor in the number being educated. Many technological developments have been introduced by educationists to industry and yet of all industries, education resists technological change the most stubbornly. The degree to which it has used, or even sought to use, the tremendous developments in communication, brought about by science and technology, is remarkably small The lecture, blackboard and chalk, continue their sorry way, as if television and other audio visual aids, had never been invented. Instances abound throughout the world of primary school and even kindergarten children, reared on films and telecasts, resisting the unsophisticated chalk and talk methods of the formal classroom.

The degree of resistance to change is almost a matter of pride to many educationists. In their minds, it is a proof that whilst change may be the order of the day for society as a whole, one constant unmovable remains, i.e. education. A leader in Australian education recently defined the policy of his university as maintaining a master and student approach, irrespective of the social changes being sought and wrought by the younger generation. Indeed, the very application of the word 'industry' to education is seen by many as either a deliberate insult or a measure of the user's ignorance.

If the problem of productivity in education were such that a policy of inaction would make the .problem disappear, then concern could be limited. But the problem is not of this type; it is with us to stay, and it will grow bigger the more we delay action to solve the problem. The quotations listed below may be sufficiently apt at least to make the educationist pause and think, and at best to make him determined to look again at every aspect of his profession. Nothing less than a technological and managerial revolution in education can grapple with and ultimately solve the problems of low productivity and rising costs.

(a) Committee of Presidents of Universities of Ontario

Source: Committee of Presidents of Universities of Ontario, Collective Autonomy Second Annual Review, 1967/68

"...One factor that has an important bearing on the viability of the university system is the role being played by the Government of Ontario. Although the Government has a declared interest in the shape of higher education in the province, it has repeatedly expressed a preference for a voluntary system in which the initiative flows from the universities themselves. For example, the Minister of University Affairs in his Frank Gerstein lecture at York University in 1966 said:

"There is, moreover, much evidence to indicate that provided the universities can meet the responsibilities of our times we should undoubtedly be better off if they were allowed to continue to operate with ...autonomy."[3]

But the Government has also made it clear that it stands ready to do the job if the universities falter, as witness these words of the Minister which follow immediately after the quotation in the preceding paragraph:

On the other hand, if they cannot or will not accept those responsibilities, and if, for example, large numbers of able students must be turned away because the university is not prepared to accept them, or if, as another example some of the less glamorous disciplines are ignored, despite pressing demands for graduates in those areas, or if costly duplication of effort is evident, I cannot imagine that any society, especially one bearing large expense for higher education, will want to stand idly by. For there will inevitably be a demand - there have been indications of this in other jurisdictions - that government move in and take over."[4]

[3] William G. Davies, "The Government of Ontario and the Universities of the Province," Governments and the University (Toronto: MacMillan, 1966)

[4] Loc.cit.

(b) Professor Ivan M. Siroyezhin, School of Economics, Leningrad University

Source: "Operations Research in the U.S.S.R. as Education and Research Work", Management Science 11/1964-65 Series A.

"...The reasons for combining these approaches are economic, psychological, and scientific. Firstly, it is clear that if society pays a lot of money for education, it has to be interested in profitable results."

"...Finally, the acceleration of progress in all areas of knowledge is very high. We have a new technical and scientific revolution, but unfortunately we do not concurrently have a new revolution in training methodology in the methods of teaching either in secondary schools or beyond. Saying "we", I mean the new days' world."

(c) M. Rene Maheu, Director-General of UNESCO

Source: Address on the Opening of 1970 International Education Year by Director-General of UNESCO

"...In too many cases, the school, the college and the university far from living at one with the community, constitute tiny worlds of their own.

For example, that an electronics engineer should have no properly organised means of sharing his knowledge with those of his colleagues, friends and neighbours who would like to bring their information up to date; that an educational establishment should be used for a maximum of only two hundred days in the year, and then for eight hours a day at the very most; that young people who have studied for several years at school or university should be unable to turn their skills they have acquired to account on the labour market because they have failed in some competitive or other examination: all this is a waste - of material sources, of human potential - which must no longer be tolerated anywhere, and least of all in the developing countries."

(d) Phillip H. Coombs, former Director of the International Institute for Educational Planning

Source: The World Educational Crisis:
Oxford University Press, New York, 1968

"...An educational system can lose the power to see itself clearly. If it clings to conventional practices merely because they are traditional, if it lashes itself to inherited dogmas in order to stay afloat in a sea of uncertainty, if it invests folklore with the dignity of science and exalts inertia to the plane of first principles - that system is a satire on education itself. Individuals showing authentic gifts may still emerge from such a system. But they will not have been produced by it; they will merely have survived it. Moreover, from the standpoint of society, the resources invested in perpetuating such a system are misused resources - misused because a high proportion of its students will emerge ill-fitted to serve well either themselves or their society."

"...As things stand, the educational profession itself, viewed in the mass, shows no great propensity for searching self-criticism. Nor is it quick to seize opportunities for innovations that will help teachers achieve more in classrooms, where they are now subject to so many distractions that they have little time to think. Indeed, the world-wide educational crisis is shot through with irony. While the crisis has occurred amid a virtual explosion of knowledge, education, as the prime creator and conveyor of knowledge, has generally failed to apply to its own inner life the research function it performs for society at large. It has failed to infuse the teaching profession, for transmittal into the classroom, with the knowledge and methods that are required in order to correct the present disparity between educational performance and needs. Education thus places itself in an ambiguous position. It exhorts everyone else to change his ways, yet seems stubbornly resistant to innovation in its own affairs."

(e) WICHE

Source: Western Interstate Commission for Higher
Education, The Outputs of Higher Education,
July 1970

> "...Educational decision-makers are seeking honest, viable responses to the issues of public accountability, flagging financial support, and an earlier overreaction to short-term need. They are seeking forthright approaches to the polarization of opinion about the role of the university in a free society ordered by law.
>
> The urgency of our era exhorts higher education to an examination of purposes, priorities, responsibilities, and capabilities. Having made a decision to be both responsible and responsive to the needs of society and the individual, the first step toward meeting those obligations is a purposeful allocation of resources. There is no clearer reflection of the values and purposes of an institution than a review of its priorities in allocating resources. Such purposeful allocation will require a careful analysis of the activities, outputs, and objectives of higher education.
>
> Surely we can do no less."

Peoples and governments may be prepared to meet the rising costs of education, as the demand for quantity and quality increases, but it is doubtful if they will continue to meet such costs at the present low productivity rate. If productivity does not increase, budgetary cuts will be made by governments in an endeavour to force improved productivity. Such an enforcement could never be more than a partial success, against which would need to be counterbalanced the negative attitudes engendered in most of the participants.

The task of improving productivity in the education industry must be carried out by the educationists and administrators associated with it. A constant pressure to do so will emanate from treasuries, governments and in time, the community itself. There are four major approaches to the problem:

* The application of the new technological developments to the learning and teaching processes

* More systematic development, review and simulation of national and regional strategies and policies

* Greater use of the research and development methods of like nature to those used by industry and commerce, and on an equivalent scale

* Improved management and planning at institutional level.

1.3 COMPARATIVE ASSESSMENT BETWEEN AUSTRALIA AND ELSEWHERE

The study tour was not of sufficient length and range to permit comparative assessment in any depth. Nevertheless, some tentative judgements were formed and these are now offered.

In the broadest terms, Australia has as much to teach as she has to learn. In Asia, to the future of which Australia is inevitably bound, there is little to learn, unless account in taken of the spirit of dedication with which education is being tackled in some countries. However, Australia has much to teach in Asia, and every endeavour should be made by government authorities and educational institutions to foster relations in Asian institutions. Such endeavours might well include:

* Consulting work for Asian organisations[1] and institutions

* Exchange of staff

* A communications network negotiated through the UNESCO Regional Headquarters in Bangkok.

When one turns to the U.S.S.R., several major differences are acutely discernable. The political and economic structure of that country is such as to give greater emphasis to centralist planning. The foreseen needs of the economy, therefore, play a bigger role in the provision of places in disciplines and fields of study, than is the case in Australia, where student choice is the predominant philosophy. Educational planning in Australia tends to be concerned with predicting changes in student attitudes to different courses, and to give only secondary importance to the changing needs of the economy. Inevitably, this results in shortages and surpluses of graduates in different fields, as graduate output is rarely in step with the changing labour market.

Whether the labour market approach has any advantage over the student choice philosophy is difficult to determine. Even in the centrally planned economy of the U.S.S.R., there have been many instances of over and under supply of graduates, for the most careful planning is easily invalidated by unforeseen or underestimated technological developments and changes in social attitudes.

A major field for research by educational planners is ways and means of permitting a high degree of choice of course by individual students, whilst seeking to minimise the negative results on the labour market, as a result of the educational system producing either too many or too few graduates in particular fields. It would seem at least desirable that higher education should endeavour to forecast the needs of the economy, and to use such data to influence students in their choice of careers. Another significant area for development is a vocational guidance system[2] which would be far more sophisticated than at present exists in either secondary or tertiary education. A graduate who cannot find a job too easily becomes socially disoriented; the same is probably true for the graduate who readily finds a job but is quickly disenchanted with it. As with so many facets of planning and management in fields of human endeavour, the task is to limit the inefficiencies of the system to the greatest extent possible, and, through experience thus gained, to continue to seek further improvement.

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[1] The Western Australian Institute of Technology is currently establishing such links with several different Asian organisations, partially as a result of contacts made during the study tour.

[2] Some interesting work is being carried out by the Vocational Guidance Association, 37A Devonshire Street, London.

In the U.S.S.R., the universities occupy an elitist position and admission is strictly limited to the most academically qualified. A little less than [illegible]% of students go to universities, which are seen as producing the next generation of academics, the next wave of researchers and the future leaders of the various professions. The bulk of the students go to vocationally oriented institutions, many of which are monotechnical, although there is some evidence showing a shift towards the polytechnical.

The system of elitist universities, supported by a very large number of vocational institutions, has some advantages. It is a precise national system, readily understood both by the planners and the community. The academic lines are distinct and rarely blurred. The different types of institution have objectives which are sharply defined and hardly ever transgressed. This makes for ease of operation and the curtailment of status arguments.

Some other aspects of the U.S.S.R. higher education system are worthy of note. A strikingly large number of students are studying part-time or externally, with sandwich courses being well developed. A large percentage of higher education students are continuing to work whilst studying externally or part-time, with generous time-off allowances from work being available. It is clear that in the next decade the U.S.S.R. will be exploiting effectively the new communication media in the interests of external students. The use of educational television is already being given a strong emphasis.

Of considerable interest is the imagination and determination with which inter-disciplinary studies are being pursued. In contrast to the impression which is generally held of the Soviet system being pedantic and orthodox, the facts given to me indicated that the U.S.S.R. is making considerable headway in developing new fields of study, in readiness for the technological changes expected in the years ahead. Nowhere is this more obvious than in such fields as water resources, the development of nationalities within the Union and community health services.

Until recently, higher studies in administration and management received scant attention in the U.S.S.R. One may legimately hazard the guess that management was seen as mandatory in capitalist economies, but not in socialist economies. Nothing could be more incorrect, and the U.S.S.R. has paid a big penalty for this error in judgement. Much of the bureaucracy is inefficient; alongside the most advanced and sophisticated scientific and technological work exist managerial systems which are outmoded and costly. It was interesting to find that, at long last, the authorities seem to have recognised the importance of management education. A big effort is likely to be mounted to overcome the neglect of many years. The authorities seem determined to find their own way instead of importing experts from overseas; they are going to learn by trial and error. Big groups of Soviet officials and others are being sent to foreign conferences and the like, in the vain hope of cramming knowledge. It may well be doubted if such efforts are worth the time and expense involved; at least they serve to demonstrate a major change in Soviet thinking - management has been recognised as an essential, and education in management is now being emphasised.

In Europe, the study tour concentrated on such international organisations as the International Labour Office (ILO), the Organisation for Economic Co-operation and Development (OECD) and the United Nations Educational Scientific and Cultural Organisation (UNESCO). As a result, no direct study was made of national systems, although some interesting information and opinions were obtained from men and women of different nationalities working for the international agencies. A few points seem to be of sufficient interest to mention immediately.

Despite every endeavour to accord equal opportunity for higher education to all classes of students, irrespective of parental occupation and income, the evidence is that the national systems remain heavily weighted in favour of the higher income groups. Several objectives and factual reports show that the percentage from low income families of the academically qualified obtaining higher education is declining rather than rising. This is leading many government and education officials to advocate a policy of positive discrimination in favour of students from low income families, i.e. to advantage such students in the admissions process to the detriment of those coming from higher income families. The policy is seen as the only way to avoid social unrest and to democratise higher education, in practical terms as distinct from theoretical.

Recent research surveys in Australia indicate a similar situation, and it would seem desirable for Commonwealth and State Governments to consider methods by which the trend may be significantly altered. The problem of low income families being proportionately disadvantaged in the pursuit of higher education for their children has serious social and political implications; it requires far greater research and then the quest for positive solutions than has hitherto been the case.

Facts given by the Australian Council for Educational Research show that there are wide disparities between the individual states of Australia in the potential pool of students for higher education. The percentages in 1968 of students remaining in secondary education until the age of 16 or 17 were as follows:

Victoria	45.6%
South Australia	38.9%
New South Wales	36.6%
Tasmania	28.5%
Western Australia	27.1%
Queensland	19.4%

Further investigations would be necessary to see whether these differences also have some relationship to income levels of families.

The student unrest in France in 1968 has led to several major changes in education in that country, these in turn influencing other European nations. The most interesting would seem to be:

- Changes in curricula to achieve greater relevance to modern life
- Greater participation in the decision-making processes by students and junior academics than was hitherto the case
- Stronger efforts by the universities to relate their research programmes to the economic and social development of their regions
- More institutions which are multi-disciplinary in their structure
- Greater autonomy to the institutions of higher learning in the control over budgets, once approved, and academic policies.

It was noteworthy that amongst European educationists, especially the more radical, great interest was often expressed in the policies which are developing in Sweden. Amongst these are:

- Experiments in the government of institutions of higher learning, with greatly increased staff and student participation (staff representation covers all elements such as academic, administrative and technical)
- A stronger emphasis on continuous education - age 16 to 60 - with a lessening significance for immediate post-secondary education
- Co-ordination and investigation techniques to relate educational objectives to the foreseen needs of the nation
- An egalitarian approach to opportunities for higher education
- A national research programme, into which is integrated the research work of universities and institutes of technology, whilst still encouraging flexibility of approach and decision-making
- Consideration of an Open University approach in order to give opportunities to those disadvantaged in their early years or now wishing to have the opportunity of a new career.

In the United Kingdom, the most obvious deficiency, in my view, is the lack of a coherent national plan for higher education. A lot of work has been done on projecting the growth in student enrolments but this in itself does not constitute a national plan; it merely reinforces the need for one. Even officials at the highest level, when directly questioned on the availability of a national strategy for higher education, reluctantly agreed it did not exist.

The binary approach of universities and polytechnics may be workable if answers are found to such fundamental issues as: the objectives of the two systems, and their compatibility or otherwise; methods to be used to co-ordinate the two systems and, indeed, between institutions of one system; the changing of the system of local government to permit national planning, as distinct from loosely connected regional planning techniques; full autonomy for the polytechnics; and more sophisticated national methods to be used in determining the allocation of finances to individual institutions. Present methods as used by the University Grants Committee are at best ill-conceived compromises, at worst lamentable examples of penalising the radical and rewarding the conformist universities.

Although co-operation between universities and colleges of advanced education in Australia leaves much to be desired, particularly in the area of transfer of students between institutions, the situation is superior to that obtaining in the United Kingdom. In that country, dialogue between the universities and the polytechnics hardly exists and, where it does, it is often conducted in an atmosphere of mutual suspicion, which stems from inadequate national understanding rather than from any significant degree of institutional or individual wilfulness.

It was against this background that I found the Western Australian Tertiary Education Commission to be of great interest to United Kingdom officials and educationists. (Equal, if not greater, interest was expressed subsequently in Canada and the United States of America.) This appears to be an appropriate moment to summarise the Parliamentary Act[1] which created the Commission.

The functions of the Commission are:

(a) subject to the Minister, to promote, develop and co-ordinate tertiary education having regard to the needs of the State and the financial and other resources available to it

(b) to consider the future development of tertiary education institutions including the establishment and development of new ones and, for that purpose, to confer with appropriate authorities in the State on the selection of sites and recommend to the Minister the acquisition and reservation of sites

(c) to review submissions of tertiary education institutions relating to triennial programmes and make recommendations to the Minister on the levels of financial support requested in those submissions

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[1] Western Australian Tertiary Education Commission, Act No. 84 of 1970, 30th November 1970

(d) to consider any request for a variation from an approved triennial programme of a tertiary education institution and make recommendations thereon to the appropriate Commonwealth or State authority

(e) to consider -

  (i) the terms and conditions of appointment and employment, including salary payable, of the staff, whether academic or otherwise, of each tertiary education institution; and

  (ii) all claims relating to those terms and conditions,

and make recommendations thereon to the governing authority of the institution

(f) to consider the fees to be charged by and paid to each tertiary education institution for classes or courses, examinations, and academic awards conferred and make recommendations thereon to the governing authority of the institution

(g) to consider proposals for the establishment of new tertiary education courses of study and to make recommendations thereon to the governing authorities of the respective tertiary education institutions for the purpose of achieving rationalisation of resources and the avoidance of unnecessary duplication

(h) to co-ordinate the criteria for entrance to tertiary education institutions for the purpose of avoiding multiple examinations; and

(i) to determine the minimum requirements for new academic awards by tertiary education institutions and accredit those awards.

In addition the Commission:

(a) shall, on matters relevant to tertiary education, confer and collaborate with departments of the Commonwealth and the Australian Universities Commission, the Commonwealth Advisory Committee on Advanced Education and other bodies or instrumentalities of the Commonwealth or the States of the Commonwealth

(b) shall constantly review all aspects of tertiary education and, on its own motion or the request of the Minister, make reports to him thereon

(c) shall encourage and, where appropriate, promote co-ordination between tertiary education institutions

(d) shall promote and undertake research into the needs and problems of tertiary education.

The Tertiary Education Commission has yet to show that it will match its promise with performance. In the meantime, it appears to be a unique experiment in the co-ordination of higher education, and as such will be followed closely overseas.

It was disappointing to observe the relative inefficiency of institutional administration in the United Kingdom. Cost analysis techniques are in an elementary stage of development and, in fact, are opposed by many academics and administrators. The utilisation of space in universities proved to be low when compared to the Western Australian Institute of Technology and details will be shown in Chapter 2. With a few important exceptions, such as the University of Sussex, experimentation in the management of higher education is in low-key, whilst few institutions have adequate planning resources, or have begun to think in terms of new management tools, such as programme planning budgeting or costs per full-time equivalent graduate. Computer simulations of the results of alternative policies are discussed but rarely used.

However, the United Kingdom has initiated one major experiment in education, the Open University. This is an exciting and interesting development, well worthy of serious study in Australia. Chapter 4 is devoted to the Open University, inclusive of an analysis of its applicability to Australia.

In Canada, my time was spent in only one province, Ontario - which is the most advanced. There are major variations in the Canadian scene, resulting in the main from the degree of prosperity obtaining in the different provinces. Australia has avoided quite such marked differences in the quantity and quality of education available in the states, and in this connection appears to be more advanced and consistent than either Canada or the United States of America. Ontario is spending enormous sums on higher education, in accordance with a policy that began over a decade ago. The result has been staggering. Many new universities have been established and twenty colleges of art and technology have been founded in recent years. Massive retraining schemes are underway through the initiative of the Federal Government. The results have been a mixture of the positive and negative. Education has improved in quality, whilst the growth in numbers has been dramatic. However, as generally occurs when a crash programme is undertaken, a great deal of waste has resulted. The major emphasis is now on improving productivity in higher education, whilst computer programmes are being developed to forecast the possible results of different types of educational strategies.

Ontario uses a system known as formula budgeting to decide on the financial allocations to universities, and the system is sufficiently interesting to be worthy of detailed study by the Commonwealth Department of Education and Science. This system is explained in detail in Chapter 3.

The most refreshing aspect of education in Ontario, and that from which Australia could learn most, is the intensity of effort to engage the public in dialogue. The following quotation from the interim statement by the Commission[1] on Post-Secondary Education illustrates the point:

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[1] Commission on Post-Secondary Education in Ontario: A Statement of Issues

"...It is our hope that via briefs, public hearings and other fact finding, Ontario citizens will engage in a fruitful public debate with the Commission.

Our Interim Statement is meant as an invitation to such a debate."

Amongst the questions being posed by the Commission are the following:

1. Why do we keep piling one year of schooling after another upon our students? Why is it necessary to have up to twenty years of continuous schooling? Why not break it up and, if necessary, space the years over a lifetime?

2. Why is it necessary to assume that "learning" must take place only when institutionalised? Why would it not be possible to have, in place of segregated and fragmented institutions, a plethora of educational services available to all, at any age? Is "research" only possible at graduate level?

3. Why should professional associations be allowed to stipulate formal educational requirements instead of administering tests regardless of educational backgrounds? Why, indeed, do we use degrees and diplomas for certification purposes? And if we must, why not issue such degrees and diplomas for only a limited period - say for five or ten years? After all, why should one certification last for a whole lifetime?

4. Is there any justification for the "academic year"? Do we still believe that students must go back to the farms to help with the harvest hence the need for free summers?

5. What are the true implications of universality for post-secondary education? Even if it is assumed that universality does not mean attendance by all but merely an equal opportunity of access for all, how "far-up" - for how many years - should this be? All the way to the Ph.D? Why should society invest this kind of money in one person and not in another? Merely because one is being "educated".

The Ontario province has a unique institution in the Ontario Institute for Studies in Education (OISE). Founded in Toronto in 1965, it combines graduate studies, a research and development centre and a regional laboratory. The following quotation[1] gives an indication of the Institute's objectives.

"...When the Ontario Institute for Studies in Education was founded in July 1965, it was heralded in many quarters as a landmark in the history of Ontario education. No longer would the practicing educator need to grope unaided for solutions to the schools' myriad problems; here at hand would be a community of scholars from many disciplines, supported by a strong corps of research assistants and professionals from many fields, working together in an Institute adequately equipped, housed, and financed. We who helped establish the Institute envisaged a vital and productive union between the specialised competencies and rigorous methodologies of scholars, and the diverse skills and experience of practitioners. We planned a partnership that would yield abundant benefits to students, teachers, and school administrators both in Ontario and beyond its borders."

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[1] 1967/68 Report of the Director, The Ontario Institute for Studies in Education

It may be that the establishment of such a centre at, for example, the Australian National University is worthy of investigation.

As to the United States of America, it is impossible to comment on higher education without taking some account of the economic, political and social problems at present facing that nation. The big issues obtrude into every facet of the nation's life, and particularly into higher education, which has become the most significant battleground for opposing ideas.

An inevitable result of student protest has been a backlash from large segments of the nation. State legislatures have cut university and college budgets, sometimes to an alarming degree. Privately endowed and aided institutions are finding that the level of donations and endowments is falling significantly. All in all, this has resulted in severe financial problems for the majority of universities and colleges; some are drawing on financial reserves, others are reducing staff. The end result is problematical, but, unless some marked change occurs in American thinking, it is difficult to see how higher education can do anything other than reduce both quantity and quality, with severe repercussions on the whole society. There is a notable exception to the rule, the City of New York, where the economic and social problems are so serious that legislature and citizens alike are demanding and obtaining more money for higher education, in the hope that the problems of inequality and injustice will thus be solved.

Despite the problems, however, the United States of America is pioneering some very interesting experiments in higher education, and has two commissions on higher education, which are likely to influence not only the U.S.A. but the rest of the world. These are the Carnegie Commission for Higher Education and the Western Interstate Commission on Higher Education (WICHE).

Another development, which will in time influence Australia, is the Educational Research Information Centre (ERIC), and more will be said about this in Chapter 5.

An interesting point about higher education in the United States of America is that many of the student protests on campus are non-violent and only concerned with internal affairs. Into the latter category goes the main student demand - relevance in teaching and learning. The students are demanding that curricula be structured and taught in such a manner as to relate them to the everyday problems of work and life. This is a demand of which a lot more will be heard and it may well become a big issue in higher education in Australia in the next decade.

CHAPTER 2

MANAGEMENT: SUMMARY AND RECOMMENDATIONS

2.1 GOVERNING BODY - REPRESENTATION

It is recommended that autonomous higher educational institutions in Australia, in consultation with governments, should give consideration to stronger internal representation involving the different elements within the institution.

In most countries and institutions which I visited, the present Australian system of governing bodies being largely composed of ex-officio members and external members, with minor representation of staff and students, was the norm. However, there was considerable evidence of growing dissatisfaction with this type of structure, which is regarded either as:

(a) being too remote from organisational life, and tending to appear as a body formally endorsing decisions taken elsewhere, or

(b) endeavouring in fact to manage a university or institute without possessing the necessary detailed knowledge, with consequential damage to both the institution and society.

Academics in particular expressed this viewpoint strongly because, as trained professionals and knowledge workers, they wish to have a greater say in institutional government. This type of thinking is in line with that being expressed by many leading management experts, who believe that the management of knowledge workers will materially change in the next decade. The following quotation[1] will amplify the point:

"...For this reason, it is crucial that knowledge workers should be challenged to achieve. For this reason, in other words, managing knowledge workers for performance is as essential to the knowledge worker himself as it is to society and economy.

Knowledge workers also require that the demands be made on them by knowledge rather than by bosses, that is, by objectives rather than by people. They require a performance-oriented organization rather than an authority-oriented organization.

Knowledge workers still need a superior. The organization structure must clearly identify where final decisions and ultimate responsibility rest. Organization needs constitutional law, that is, a definition of authority and responsibility within hierarchial structure. But knowledge work itself knows no hierarchy, for there are no 'higher' or 'lower' knowledges. Knowledge is either relevant to a given task or irrelevant to it. The task decides, not the name, the age, or the budget of the discipline, or the rank of the individual plying it. For a disease of the eye, the opthalmologist is relevant, for removal of a gall bladder it is the abdominal surgeon.

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[1] P.E. Drucker: The Age of Discontinuity
Heinemann, 1968

Knowledge, therefore, has to be organized as a team in which the task decides who is in charge, when, for what, and for how long. Organization structures for knowledge work must therefore be both rigid and flexible, both have clear authority and yet be task-focused, informed both by the logic of the situation and the necessity of command."

Some interesting experiments are taking place in several countries, including the United States of America and Sweden. A group of universities and colleges has been formed in the United States under the title of "Union for Experimenting Colleges and Universities" with the centre being at Antioch College, Yellow Springs, Ohio.

In Sweden, many experiments are conducted as a result of the initiative taken by the Office of the Chancellor of the Universities (UKA) which is the national planning and co-ordinating body. The following quotation from a document issued by the Chancellor's office under the title "University Democracy in Sweden" will illustrate the experiments[1], which in this instance concern a teaching department or a discipline of study.

"...In model 1 - the least radical - there is a departmental council for educational questions, which exercises the powers of decision of the Director on questions relating to the content and organization of education. In model 2 there is a departmental council which, apart from educational questions, decides on certain other questions usually concerning the department's annual requests for grants. In model 3 there is a departmental board which in principle has the right of decision on all affairs of the department, but from whose authority certain delicate questions, such as questions concerning appointments, are excluded. In model 4, finally, there is a departmental board which decides on all kinds of questions. In models 1 - 3 the Director exercises his powers according to the University Statute on questions which do not lie within the authority of the decision-making organ, and is executive in other respects. In model 4 the Director is solely executive.

On a number of questions concerning the composition and working forms of the new departmental bodies, UKA - as I have mentioned earlier - have found it most expedient to lay down merely general guiding principles within the framework of which the local authorities are free to make decisions. As regards the composition of the new bodies, for example, it has been laid down as a guiding principle that the number of representatives for teachers and assistant teaching and research staff shall be equal to the number of representatives for the students. Above that the technical and administrative staff should be represented in proportion to their numbers.

On another central question - whether members of all categories should participate in all kinds of matters - UKA has chosen not to impose any limits on the sphere of authority of certain members or groups of members. The desire has been to stress the common responsibility for the affairs of the department, and it is considered in principle inadvisable to dictate centrally that a given category shall be concerned or interested solely in a given type of matter. In model 4, for example, students participate on department boards in dealing with matters concerning teacher appointments and representatives of the technical and administrative staff participate in dealing with purely educational questions. The confidence in the sense of responsibility of all individuals concerned, expressed in the widely representative membership, has not hitherto proved unjustified. The staff organizations have also, with some exception, accepted the principle of 'equal responsibility for all members'."

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[1] Experiments are being conducted with four different models for decision-making within single institutions.

2.2 GOVERNING BODIES - ROLE AND PHILOSOPHY

It is recommended that the governing bodies of tertiary education institutions should give consideration to their roles as being akin to the Boards of Directors of industrial and commercial companies, with extensive delegation to the executive, and their own preoccupation being with broad policies and longer term planning.

The results of the study tour played a small part in the current policy and committee structure adopted earlier this year by the Council of the Western Australian Institute of Technology. This is summarised below:

(a) Capital Works Committee

Decisions

To accept tenders for building projects and other capital works within financial approvals whenever the tender is the lowest and is recommended by the commissioned architects for the project.

To approve of allocations for major equipment to divisions and branches and for equipping and furnishing of new buildings, providing same are within approved budgets.

To implement the Council's policy, through an Art Acquisitions Committee, acting under delegated authority and required to report not less than yearly through the Capital Works Committee to the Council.

To commission architectural and allied professional services, in accordance with professional practice.

To implement the Capital Works Programme as laid down by the Council and accepted by State and Commonwealth governments.

To deviate from the Capital Works Programme, by 5% of the financial allocation to a project, subject to the approval of the Minister and the Commonwealth Advisory Committee on Advanced Education.

To implement and to keep under review campus master plans with a report being made not less than yearly to the Council.

To specifically approve of the purchase of items of major equipment costing in excess of $20,000, subject to any provisions of the Tertiary Education Commission Act.

Recommendations to Council

On Triennial Capital Works Programmes

On building planning formulae and guide-lines

On acceptance of tenders not falling within terms of power

On financial reallocation between projects, not falling within terms of power

On such relevant matters as may arise and/or on which the Committee desires the decision of Council.

(b) Finance and Staffing Committee

Decisions

To implement the Recurrent Budget as laid down by Council, and accepted by State and Commonwealth governments.

To approve of reallocations within the Recurrent Budget to 5% of original estimates under specified account headings.

To control Superannuation Investment Reserves.

To authorise expenditure not falling within policy delegations to the Institute Administration.

To write off bad-debts up to $500.

To finalise the annual borrowing of $300,000 for capital works programmes, in co-operation with the State Treasury.

To execute Council policy on endowments, gifts, prizes and donations.

To execute Council policy on scholarships and bursaries.

To execute Council policy on study leave, higher duties allowance, accrued long service leave, salary increments and such other personnel policies as may be laid down by Council from time to time, and as have not yet been the subject of delegated authority to the Institute Administration.

Recommendations to Council

On recurrent budgets, whether yearly or triennial

On reallocations within recurrent budgets, as are not within the powers of the Committee

On policy on tuition and other fees, endowments, gifts, prizes, donations, scholarships and bursaries

On bad debts in excess of the powers of the Committee

On staffing establishments, salaries and conditions for all staff of the Institute

On appointment of senior Institute officers as may be determined from time to time

On changes in personnel and staffing policies

On the adoption of annual accounts, inclusive of commercial undertakings

On expenditure from Reserve Accounts and Institute Superannuation Scheme

On such relevant matters as may arise and/or on which the Committee desires the decision of Council.

(c) Education and General Policy Committee

Decisions

Nil

Recommendations to Council

On an Academic Plan for the Institute, inclusive of major educational policies and development, the priority rating of the introduction of new courses and the phasing-out and/or elimination of existing courses

On entrance requirements and restrictions

On the nomenclature of awards, subject to the provisions of the Tertiary Education Commission Act

On the establishment of branches, subject to the advice of the Tertiary Education Commission, and the approval of the Minister

On amendments to the Institute Act

On the submission of Triennial estimates and supporting documentation

On Institute organisational structure

On long term planning and development of the Institute, i.e., for a period in the existing triennium and forthcoming triennium.

The basic ideas underlying the above are:

* to make the Council more essentially a policy-determining Board of Directors

- * to give more power to committees and the executive to execute policy
- * to rationalise efforts and time involvements
- * to provide each committee with terms of reference which are explicit
- * to introduce the concept of longer term thinking by all committees, but with emphasis on one committee (i.e., Education and General Policy Committee) and to bring ideas to the Council, which will lead to longer term decision-making
- * to provide Council with more time to concentrate on major issues, such as negotiations with Government and the Tertiary Education Commission.

The type of issues which could well be the main concern of governing bodies of colleges of advanced education are listed below:

- * a conscious exercise of its autonomy
- * the academic, physical and financial plans for triennia in two phases, (a) submission, (b) reconsideration in preparation for, and then in the final knowledge of the financial decisions made by the State and the Commonwealth governments
- * the academic, physical, organisational and financial plans for, say, the next decade
- * the degree of permanence of teaching buildings and ways and means of (a) cost savings, (b) allowing for technological changes
- * the further improvement of relationships with industry, commerce and the professions
- * the growing importance of continuous education and modern methods which may be relevant thereto
- * the obtaining of extra income through endowments, gifts and grants
- * the development and use of appropriate control criteria
- * the economic needs and related educational needs of the State
- * the development of mutual aid programmes with State instrumentalities, Commonwealth organisations and overseas bodies
- * the priority ranking of educational investigation and research projects and the financing of same.

2.3 CONTROL CRITERIA FOR GOVERNING BODIES AND THE EXECUTIVE MANAGEMENT

It is recommended that the governing bodies of higher educational institutions should give consideration to *the development of appropriate control criteria for their institutions with particular reference to the efficient and effective utilisation of resources.*

The issue of productivity in education is of growing importance. The cost of education per student, when measured in constant prices, continues to increase. Arguments can be produced to indicate that the quality is improving in line with rising costs, but this is at least partly countered by evidence that the wastage factor, either through dropout or examination failure, continues to mount. Education remains remarkably oblivious to the progress made in technological aids, and its management structure and methods have failed to keep pace with the radical changes made by industry and commerce, without which the phenomenal economic growth of the last two decades would have been severely prejudiced.

One difference must be granted. In an industrial or commercial concern control criteria for management are relatively accessible. There are such criteria as the profit and loss account; the balance sheet; the sales and production statements; the stock and labour turnovers; the various percentage and ratio techniques; the market survey; and even the public's opinion by way of the stock exchange. It is not an easy task to develop control criteria for management in education, in which profit and loss are more difficult to define and to assess. However, the difficulties must not be used as an excuse for not even trying.

By way of illustration, let us suppose we are concerned with a major tertiary institution which requires a set of control criteria in order to manage its affairs and resources more efficiently. One aspect affecting all the selected criteria is of considerable importance, namely that the factual reports should be published and widely distributed. The greater the number of informed people, the more constructive the dialogue and the debate, and the more likely that solutions will be found to the problems. Although it might cause consternation in some quarters, the very fact that education is largely supported by public funds would seem to require that the important reports should be public documents, and not - as is generally the present position - reserved for internal consumption. It is becoming increasingly absurd that major spenders of public monies should only publish, for the community, annual reports, brochures and pamphlets, which too often are paeans of self-praise, containing little reference to problems, wastage and the limited knowledge available on major educational issues.

If the community were better informed on such matters as the inadequacy of the annual examination system as the sole determinant of ability, then greater pressure would be brought on the academic world to experiment and to innovate with teaching and learning processes.

The first set of control criteria which would be relevant and helpful in improving efficiency is best related to the annual budget. In presenting an annual budget for the following year, each item is normally compared with the expenditure in the previous year; this time-honoured technique, applied to various percentage and ratio methods, serves a useful function, but it has a built-in weakness, namely an item of expenditure (which is not fully justifiable) tends to become self-perpetuating. The relative misuse of funds becomes obscured by the force of habit. To illustrate what can happen, let us assume that an annual budget contains an item on publications, which for some years has been 1% of total expenditure. As long as the 1% remains, even if the actual monetary allocation has been doubled, in company with the total budget, it is unlikely that any critical analysis will be made of, e.g.:

(a) the efficacy of standard annual publications

(b) the desirability or otherwise of new publications

(c) the numbers being printed, and

(d) the justification of doubling the amount of money to be spent.

An investigation into the budgets of many education bodies and departments might well reveal that the following rule-of-thumb method is used:

(A) Total Budget

$$\frac{\text{No. of students estimated Year 2}}{\text{No. of students actual Year 1}} \times \text{Budget Year 1} = \text{Budget Year 2}$$

(B) Items in Budget

$$\text{Item Year 1} \times \frac{\text{Budget Year 2}}{\text{Budget Year 1}} = \text{Item Year 2}$$

In contrast to this technique, which inevitably transfers inefficiency from year to year, the more appropriate method is to consider each item of expenditure, in detail and in isolation, and to thus construct a physical budget, from which ultimately is produced a fiscal budget. By this method, each item of expenditure must come under critical scrutiny and, at least once a year, the efficiency of each aspect of the organisation would be tested.

A number of criteria can be used in the annual review, and some of these are set out below, divided into different categories:

Cost Analyses

(Actual for year ended: estimated for year about to begin)

* For each teaching department and/or course, the cost per equivalent graduate and per full-time equivalent student should be known, and in sufficient detail to permit effective comparisons

* An assessment, arising from the above data, should be made of the amount of resources wasted on:

(a) dropouts and

(b) failures

- Each department, under such a system, would be required to explain the wastage element and to justify the costs (at constant prices) per equivalent graduate and per full-time equivalent student

- An analysis per teaching department of average salaries for:

  (a) academic staff and

  (b) technical and other support staff

  would be made, in order to assess the effect of annual increments, and the commencing salaries of new staff, on the cost of running the department. (The need for such an analysis is easily seen when it is realised that annual increments and a rising average starting salary can erode the capacity of an organisation to expand, and will automatically cause a rising cost per graduate or per student. Knowledge of the facts may reveal a necessity to change recruitment policy and/or the ratio of full-time to part-time staff.)

Supplementary Analyses

- A report from each department on the annual utilisation expressed in hours for each major item of equipment (costing, say, over $2,000). Such a report would be used to assess:

  (a) the relative value of requests for new equipment, and

  (b) the desirability or otherwise of retaining existing equipment.

  (Such a technique does not preclude the possibility of purchasing or retaining equipment with a small degree of utilisation, but would ensure justification on demonstrable educational grounds.)

- A report on the supply of stock items, including the value of stock-holdings at the end of the financial year, to enable calculation of the stock turnover rate; the number of transactions and the average value, in order to assess the degree of forward thinking and the success or otherwise in using the purchasing power of the organisation to obtain quantity discounts.

- Statistical data is needed on the Library, including stock-holdings, number of borrowings, number of readers, and if possible, a report on any volume which had not been borrowed for, say, six months. Such a review would not only be a commentary on the purchasing/acquisition policy, but also an indicator of the success of efforts to promote individual study.

- Teaching hours for each department, accompanied by a report from each head of department on work-loads, other than class-contact, which he considers his staff undertake. The latter would be subjective, but valuable in assessing the department's contribution to solving its own problems. (There is no logical reason why the industrial technique of necessity being the mother of invention should not apply to education.)

- Staff:student ratios per department, set out under three categories:

  (a) academic

  (b) technical, and

  (c) other support.

  Academic staff establishments are likely to be set by formulae[1]. As far as technical support staff are concerned, any major tertiary institution should have an organisation and methods officer, well qualified in work study, and he should investigate every laboratory and workshop at least once a year.

- Maintenance costs of buildings and grounds should be reported in detail and with clear distinction between normal maintenance and minor new works. Each building should be the subject of a separate report, on a per square basis, under major trade headings, e.g. electrical, mechanical, carpentry and plumbing. As far as grounds are concerned, it would appear logical to divide these into recreational and other, and to give costs on a per acre basis, with the separation of the significant elements, e.g. labour, water and new and upkeep purchases.

- Administration costs are likely to involve a large number of items. As far as staff establishments are concerned, the organisation and methods experts should review each administrative section at least once a year. In the changing pattern of today, there is good reason to believe that the computer may be the best tool by which to reduce administrative costs, whilst simultaneously increasing the possibilities of obtaining significant data when it is required (and not too late, as is so often the case with clerical systems). Each item of expenditure should be the subject of a separate investigation and report, i.e. the physical budget should precede the fiscal.

Before proceeding to detail other control criteria, which are not specifically related to the annual budget (although they may be of value in the budget discussions), there is an important point to make on all the criteria.

Education is heavily compartmentalised. The university does not know the data available in the institute of technology. The institute is unfamiliar with the costs in the technical college. The teachers' college is remote from its sister tertiary institutions. The detail of the costs of the secondary and primary systems are unknown to the tertiary. And even between institutions of the same family, there is little exchange of cost and other data.

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[1] A thorough-going investigation of current methods of setting academic staffing establishments is long overdue in many Australian institutions, including the Western Australian Institute of Technology.

The free exchange of data between institutions, and the different parts of the whole system of education, should be achieved if all are to benefit from each other's knowledge and systems.

A few illustrations may reinforce the point:

On building costs, institutions should exchange data on each project, including the cost per square, gross-nett ratios, materials used, and design concepts. It seems truly incredible that each institution works in isolation, and that there is no national clearing-house for plans and costs of educational buildings.

As far as supplies are concerned, it would seem desirable for the tertiary institutions to provide each other with unit prices on all items of consumables and furniture etc. on which, say, more than $1,000 is spent per annum. It would seem high time that the big tertiary institutions used their purchasing power as efficiently as possible.

Let us turn to other control criteria, which may aid in achieving greater efficiency in education. A number are listed below:

- Space utilisation analysis per unit of accommodation, on a student station basis. (This would aid in ensuring the proper relationship of capital works to recurrent expenditure.)

- Staff turnover rates and reports thereon, including comparative data from e.g., research organisations, public service, selected major industries, and sister institutions. (Such information may assist in ensuring adequate personnel policies.)

- A monthly general purpose report on e.g., accidents, equipment breakdowns, reasons why offers of appointment were not accepted, number of computer runs and average times, the number of sheets run through offset or duplicating machines and the number of photo-copies made.

- In commercial undertakings, such as a cafeteria and a bookshop, normal business methods should be employed, i.e. monthly trading accounts and profit and loss statements. Certain statistical data should be made available simultaneously, e.g., number of meals, number of sales, average value of sales, and detail of peak load periods.

- A report on the cost and results of each advertisement, to enable continuing review of the efficacy of the methods being used.

- An annual report on the structure of curricula, with particular attention on:

  (a) the class-contact hours

(b) the staff contact hours (i.e. allowing for more than one staff member in laboratories and workshops), and

(c) the number of options available.

(In the case of the latter, there is a high proliferation of options in the vocationally-oriented institutions, and justification should be rigorously enforced.)

* Detailed annual reports on enrolments and examinations, which give the input and output data, and the raw material by which to compute the costs per equivalent graduate and per full-time equivalent student.

It is to be hoped that the above demonstrates that effective control criteria for the management of education can be developed and used, even if those suggested are modified or even discarded. The first and paramount requirements are recognition of the urgency of increasing productivity in education, and the realisation that part of the answer may lie in the application of modern management methods, along lines similar to those proposed in the foregoing.

In further development of the per equivalent graduate cost analysis system, the report of Mr. L.M. Croy, Research and Planning Officer of the Western Australian Institute of Technology, in developing ideas of the writer, appears in Annexure 2/I at the end of this chapter.

2.4 USE OF 'DELPHI TECHNIQUE' FOR DECISION-MAKING

It is recommended that consideration should be given by governing bodies and internal executives alike to the utilisation of the 'Delphi technique' for the systematic solution and evaluation of expert opinions. (The 'Delphi technique' is applicable whenever policy and plans have to be based on informed judgement, and thus to some extent to the majority of decision-making processes.)

The following quotations from a UNESCO document[1] will aid in understanding the 'Delphi technique':

"...Instead of using the traditional approach toward achieving a consensus through open discussion, the Delphi technique in its simplest form:

'eliminates committee activity altogether, thus...reducing the influence of certain psychological factors, such as specious persuasion, the unwillingness to abandon publicly expressed opinions, and the bandwagon effect of majority opinion. This technique replaces direct debate by a carefully designed programme of sequential individual interrogations (best conducted by questionnaires) interspersed with information and opinion feedback derived by computed consensus from the earlier parts of the programme. Some of the questions directed to the respondents may, for instance, inquire into the 'reasons' for previously expressed opinions, and a collection of such reasons may then be presented to each respondent in the group, together with an invitation to reconsider and possibly revise his earlier estimates. Both the inquiry into the reasons and subsequent feedback of the reasons adduced by others may serve to stimulate the experts into taking into due account considerations they might through inadvertence have neglected, and to give due weight to factors they were inclined to dismiss as unimportant on first thought.'

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[1] "The use of the Delphi technique in problems of educational development and innovation" by Olaf Helmer.

(Considered at an International Institute for Educational Planning Conference in Paris, July 1970)

The general method outlined above, including its variants, can be applied to all phases of educational planning, at the federal, state, local, or individual institutional level: a district superintendent of public schools, intending to institute a curriculum reform, may want to take opinion soundings through the Delphi technique among selected administrators and teachers within his district; a state educational planning office might decide on a building programme after first consulting, via Delphi, with the local superintendents; a university's long-range expansion programme must reconcile the views of its various departments, and a Delphi approach, using one or two administrators and a cross-section of departmental representatives as a panel of respondents, may well be the most appropriate way to achieve this; or, on the national level, the U.S. Office of Education may wish to establish a comprehensive programme of educational innovations: this is a multifaceted problem, with a number of opportunities for the application of the Delphi technique.

Since educational innovation planned today will probably not be introduced for several years, and since the effects of such innovations - in terms of increased ability among new graduates to cope with the vicissitudes of life - may not be noticed for many years thereafter, decisions regarding such innovations cannot really be made rationally without a reasonably clear image of what the socioeconomic and technological environment of the next few decades will be. A general long-range forecasting study[1] of this kind was conducted a few years ago using the Delphi technique, but a more up-to-date study, placing proper emphasis on the aspects most relevant to education, would provide a useful foundation for planning educational innovations.

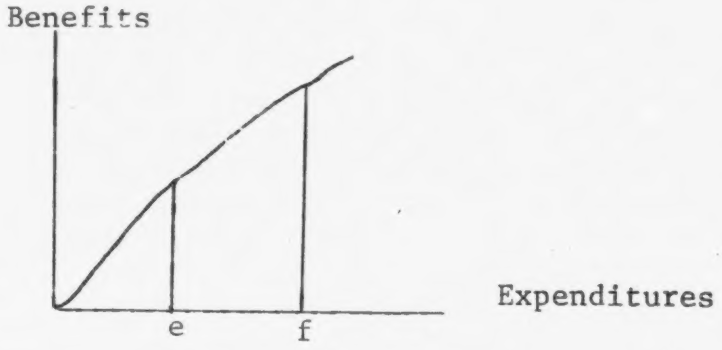
In view of the projected character of our future environment and the effect we wish to exert on it through educational endeavour, it is necessary to establish appropriate educational goals. This is largely a matter of preference judgments, to be obtained through the Delphi method from a cross-section of educators, psychologists, sociologists, and community leaders.

After these preparatory steps, a wide survey of suggestions for potential educational innovations should be made; this compilation should be pared down by eliminating items that, on careful consideration, offer little promise of contributing to the educational goals previously established.

"[1] Theodore Gordon and Olaf Helmer, "Report on a Long-Range Forecasting Study", RAND Corporation Paper P-2982 (1964); subsequently published as an appendix to "Social Technology" by Olaf Helmer, Basic Books, (1966)."

Then an estimate of the dollar cost of each item in the resulting list of contemplated innovations should be made. For some of the items on the list (those which represent simple extensions of present-day practices), established costing procedures based on current data will furnish reasonably accurate cost estimates. For others, the opinions of experts may have to be obtained. It should be noted here that usually these estimates will not be single numbers but functions of the extent to which the innovation is to be instituted; for example, computer-controlled instruction can be introduced at various levels of intensity and coverage, requiring a wide range of associated expenditures.

A cost-benefit estimate for individual innovations is necessary, in order to determine the over-all net benefits expected to be derived from a given dollar expenditure for each proposed educational innovation. This relationship is typically represented by a curve such as that shown, indicating that expenditures, if any, should reasonably be confined to an approximate interval from e to f, because expenditures below e yield insignificant returns, while expenditures above f yield rapidly diminishing marginal returns. Again, an attempt to reconcile initially differing opinions, represented by different curves, can be made by a Delphi inquiry.



And finallv, on the basis of these cost-benefit estimates a programme of educational innovations can be constructed by allocating a given budget among the items on the list of innovative proposals. If these items were entirely independent of one another, an optimal allocation could be computed at this point, using the principle of maximizing marginal returns. However, because they are intricately interconnected (in terms of costs as well as benefits), an appeal to judgement must once more be made, and a combined simulation-Delphi use of experts may be indicated."

2.5 NEED FOR GREATER EXPERIMENTATION

It is recommended that the governing councils in collaboration with the internal executive should encourage methods of greater experimentation in higher education and, to enable this to be done effectively, to press for larger governmental allocations to research projects.

The need for such experimentation is underlined by the following quotation[1].

"...Thus if an institution wants to try to avoid the likelihood of reform, it might try these steps:

First, be sure that all newcomers are impeccably orthodox. Do not admit any deviance of any kind, and drive away all dissidents and nonconformists as heretics and subversives. Establish as many regulations as possible to maintain conformity. Do not permit anyone who is persuasive to gain leadership. And do not allow discretion - including any discretionary funds.

Next, remember that oligarchy is even more resistant to change than autocracy. An autocrat may possibly institute change, but not an oligarchy - particularly a geriatric oligarchy. Thus make sure that power accrues to the oldest members of the organization - the longest in seniority, the most vested in rights. Keep trustees on until they drop; retain department chairmen in office until they retire; keep inbreeding high. And do not permit newcomers much influence: they may not yet agree with you that things will blow over if you just wait long enough.

Give complete authority to the oligarchy. For example, do not permit any new programs or experiments without the approval of all the standing committees remotely involved, as well as all the department chairmen and the entire faculty. Assure the faculty that professionalism means the rejection of any external supervision or interference with both the means and the ends of your institution. Explain to laymen - to trustees and students - that because they are ignorant nonprofessionals, they are incapable of making correct educational decisions.

Recall F.M. Cornford's first law of academic life: 'Nothing should ever be done for the first time.' Assume that any proposed educational experiment would become eternal - not subject to reevaluation. Believe that your curriculum is inviolate, rather than a political compromise about the petrified remains of the extra-curriculum. Maintain that the golden age of man was in the past, that therefore any change would be a decline and a retreat, that any change of standards is ipso facto a lowering of standards. Above all, eliminate competition and maintain your own hegemony. Convince wealthy patrons - including, if possible, the government and foundations - that no rival institution should legitimately receive funds, that yours alone is the last bastion of truth, that Western civilisation will collapse without the survival of your rituals, and that the only assurance of protecting your institution from the whims of fate is millions of dollars of unencumbered endowment, over which you alone should have control. And then proceed to maintain that all new educational needs are the responsibility of other institutions.

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[1] "Ritualism, Privilege, Reform" J.B. Lon Hefferlin: Journal of Higher Education, October 1970 (published by the American Association for Higher Education and the Ohio State University Press)

Do so, and rest assured that even though these techniques may not stave off change forever, you will eventually be able to make any necessary alterations quietly without attracting attention, for by then society will have forgotten all about you: the world and its problems will have passed you by. But if this is not the fate you desire, you might try the opposite techniques. They will lead to what I would most simply term an open institution - an institution open to ideas, to influence, to conflicting values, to change; in short, open to the environment. Such an institution, I admit, will not be calm. But it will at least be significant."

As further illustration of the need for experimentation, the following quotation from a document[1] issued by the Union for Experimenting Colleges and Universities, Antioch College, Ohio, will be of assistance:

"...Rationale and Need

The prevailing paradox in higher education today is a flood-tide of students eagerly seeking admission to college and in too many instances, their subsequent disillusionment, apathy, dissent and protest.

Piece-meal reforms within the traditional structure of the American college have usually proven palliative but not redemptive. Here and there, now and then, for a short time, various colleges have introduced independent study, field experiences, travel abroad, computer-assisted instruction, tele-lectures, inter-disciplinary courses and seminars, experiments with the admission of the previously inadmissible, more intensive orientation and guidance programs, along with a myriad of extra-curricular activities. None of these, and no combination of them, has as yet transformed the standard model of the undergraduate college, or eliminated student dissatisfaction.

Meanwhile, pressures are mounting. More students apply for entrance and numerous colleges now despair of any significant improvement in their instruction because they are trying to cope with thousands of students in facilities appropriate to hundreds. The new entrants are more diverse as well as more numerous. They differ from one another, and from preceding college generations, in their values, skills and knowledge. No single prescribed curriculum, no set of optional 'majors', is going to meet all these students where they are now, and nourish their continuous growth in curiosity, spontaneity, appreciation, understanding, competence, concern and character.

Financial pressures have grown serious. The future of small private colleges has become precarious. State schools struggle with budget cuts imposed to keep taxes from soaring. If any more economical method of education can be devised which will lower costs while preserving standards of scholarship, it will eagerly be grasped.

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[1] Extracted from the "University without walls" proposal for an Experimental Degree Program in Under-graduate Education, September 1970

Pressures are mounting also from the new needs of a changing society. Recent research continually outruns textbooks in most of the sciences. Technological advance has altered many of the old occupations and created new careers for which few colleges give good preparation. New viewpoints and ideas are arising, not only in science and technology, but also in the social sciences and in all the creative arts. Faculty and students alike have become only too aware that what has been, or what is now being taught, is in too many instances rapidly becoming outdated.

The most immediate indicators of these mounting pressures is the severe crisis in college and university governance which has been building during the past several years. The lines of tactical riot squads and National Guard troops on several campuses, stand as clear warning, even at this writing, that some fault threatens to collapse the very foundations of present programs of higher education. Problems of financing aside, we need to address ourselves to the critical questions of individualisation and meaning and impact of higher education.

Rapid advance within a sophisticated civilisation produces not only problems beyond the traditional curriculum but also resources which have never been well used in higher education. In most cities there are specialists of high competence in fields which do not appear in the college catalog. New specialties emerge every month. There are banks of systematized knowledge which extend far beyond the college library. There are agencies of communication which link the world more efficiently than some campus switchboards link the department offices. There are not only unresolved conflicts and problems but also continuous experiments in coping with these, which go far beyond the resources of any campus laboratory. There are interesting people working out their own lives in ways which transcend the stereotyped patterns of American child, adolescent and adult roles. In short, there is more going on that has educational significance away from the campus than can possibly be brought onto it.

Attempts at major innovations which have sought to develop radically new forms for undergraduate education, have inevitably encountered resistance from administrators, faculty, students and parents alike. For all of us, having experienced our own education in a particular mode, have become accustomed to think of the undergraduate education as having to occur in a certain 'place' or buildings known as a college, where students and faculty meet together for a set number of weeks and over a set number of years; after which period one is awarded (or not awarded) the undergraduate degree.

It seems clear that if we really mean to address ourselves to the many problems that now beset our increasingly troubled colleges and universities, it will no longer be sufficient to fit new pieces into the old framework. Bold new forms are needed, breaking the constraints which have fettered faculties and students and prevented creative adaptation to both individual and social needs in this changing civilisation.

What this proposal argues for is the development of an alternative model for undergraduate education so as to bring into play a new array of resources for teaching and learning (in, and beyond the classroom), and to allow for a much greater individualization of the student's learning experience than is now the case."

2.6 DECENTRALISATION OF DECISION-MAKING

It is recommended that the internal executive bodies of higher education institutions should decentralise much of their decision-making power, whilst retaining the central role of control over policy and budget.

The reasoning behind this recommendation has been set out previously, i.e. the demand of the knowledge worker for responsibility and some autonomy in decision-making. Higher educational institutions have an unusual staffing structure; the number and the proportion of highly trained and paid men and women is far greater than is the case in industry and commerce. It is becoming clear that they must work to objectives, with ways and means of achieving them being largely their responsibility and within their control.

The Western Australian Institute of Technology has made some steps in this direction, commencing in the first instance with decentralisation of some administrative functions. The current policy covers such matters as academic and non-academic recruitment, control of divisional and departmental staff, reprographic facilities, records and mail. Consideration is currently being given to greater budgetary flexibility being given to academic divisions and departments.

Consideration is now being given to the further development of decentralisation in academic policy including experimental research in the teaching/learning process.

2.7 WORK STUDY IN TEACHING LABORATORIES AND WORKSHOPS

It is recommended that the Council of the Western Australian Institute of Technology authorise for 1973, a limited experiment in the application of work study techniques to teaching laboratories and workshops, and that the results of the experiment be published for the guidance of other higher education institutions.

This is a specific recommendation, previously referred to under control criteria above.

2.8 SUPPLY MANAGEMENT AND PURCHASING SYSTEMS

It is recommended that the Chief Executive Officers' Committee consider arranging a national conference of appropriate officers of colleges of advanced education to discuss ways and means of:

(a) exchanging information on products, and

(b) introducing national buying of those products, the volume of which may permit the negotiation with suppliers of lower unit costs.

This is a specific recommendation, previously referred to under control criteria above.

2.9 TIME-TABLING AND ROOM SCHEDULING

It is recommended that centralised time-tabling and room scheduling be considered for adoption by all multi-disciplinary colleges of advanced education as an effective measure to improve space and time utilisation, and in the long term to assist in achieving economies in capital works programmes.

This is a specific recommendation, previously referred to under control criteria above.

A brief description of the Institute system in operation at the present time is set out below. Further revisions are being considered.

The Western Australian Institute of Technology early determined that control of the space availability of all general purpose teaching rooms would have to be centralised. By general purpose teaching rooms are meant lecture theatres, lecture, seminar and tutorial rooms. As a result of this system it has been possible in 1971[1] to achieve the following room-hour utilisation figures:

Average weekly	70% (of a 62.5 hour week)
Peak day	78% (of a 12.5 hour day)
Peak weekly one hour period	88%

In order to conduct the centrally controlled system successfully, it has been necessary to devise means of collecting and analysing relevant data on tuition structure and time-table patterns at the individual subject level. These studies have provided a subject tuition specification which is applied to projected subject enrolments in the determination of future space requirements. In this respect the centrally controlled exercise has proved to be of great value.

Description of system

Basically the system consists of a series of charts on which are annotated all classroom loadings. The charts are composed of 14 columns, one column being for one classroom, and each column being divided horizontally into half-hour periods from 8 a.m. to 11 p.m. (the normal working day is from 9 a.m. to 9.30 p.m.). Using one chart for each day of the week, a set of 5 charts is made up for each building. The classroom numbers and capacities are written on the two lines provided at the top of the chart, with the smallest room on the left, and progressing to the largest on the right.

The reason for this layout is to facilitate the work involved in recording space requirements. Throughout the academic year requests come in for classroom accommodation in the following form: type of room

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[1] The comparison between the Western Australian Institute of Technology utilisation of non-specialised teaching rooms and the figures involved in the Report by the Committee of U.K. Vice-Chancellors shows that the Institute utilisation in space and time is three times that of the U.K. averages.

(whether theatre, classroom or tutorial), day of week, time of day, number of students, and building preference. With the layout described above, a suitable room can be pin-pointed quickly and with the minimum chance of error; upon a request for accommodation, the procedure is for all sets of charts first to be opened at the day required. This eliminates the easily made mistake of booking on the wrong day. Thus, it is a simple matter to find a satisfactory room, and to offer it to the requester.

Schedule of work throughout the year

For the Space Control Section of Research & Planning Branch the year starts during the first week in September and proceeds on the following schedule:

First week in September: Receive from teaching departments their Space Planning and Staff Establishment (SPASE) forms covering their classroom and laboratory requirements for the following academic year which starts about the end of February. On these forms the subjects taught by the department are set out alphabetically, and columns are provided for recording the number of classrooms charted for the day and time indicated (Note: laboratories, being for the sole use of any one department, are not charted). Departments are asked to request on the form any special requirements they may have for a subject, such as building, floor, blackout facilities, or even a specific room.

Middle of November: All requirements are now charted. Those cases, where no accommodation has been found, have been sorted out with the departments concerned, usually entailing changes in time-tables. The SPASE forms are photocopied, and a copy is sent to the relevant department for their information and use.

End of November to end of February: During the three months of the summer vacation, the enrolments for the ensuing academic year take place. As the classrooms fill up, the Space Control Section is contacted when a teaching department requires a larger room, or has an alteration in time-table due to last minute unforeseeable changes in staffing.

The beginning of the academic year - March: The Space Control Section is available at all times to help the teaching departments solve their problems of actual room usage, unforeseen at the time of completing the SPASE forms in September.

April: The actual room utilisation data (including student-station occupancy) is extracted from a final set of SPASE forms received from the teaching departments before the end of March. The primary object of these SPASE forms, which are based on the actual class rolls, is to serve as justification for the academic staff establishments for the following year.

From these SPASE forms are derived the room-period and student-station-period data which are used to compile the Annual Analysis of Actual Space Utilisation publication. This booklet covers room-period and student-station-period data by day of week, type of room, half-hour period of the day, and size of room.

Throughout the academic year: Throughout the year, the Space Control Section provides ad hoc general purpose room space allocations for visiting lecturers, special meetings, etc. These requirements are pencilled in lightly on the charts, each entry incorporating the date of the one-time requirement. The charts are inspected once a week and all such entries, now out of date, are erased.

Academic staff accommodation

The Space Control Section is used as a repository for the cross-indexed records of all academic staff accommodation. The records are filed by alphabetical order of the staff member's name and cross-indexed to the building's floor plans showing the occupants of each room. In this way requests for information concerning academic staff accommodation can be answered without delay.

ANNEXURE 2/I

COST MODELS

SECTION 1

A MODEL FOR THE ANALYSIS OF HISTORICAL COSTS

The model provides four basic facilities:

1 A synthesis of expenditures, by selected classifications, assignable to each Course of Study.

2 A perspective of the interdependencies between teaching Departments and their implications regarding costs and resource requirements.

3 An analysis of wasted expenditure due to sub-optimised supply and demand conditions of physical resources, student withdrawal and failure rates.

4 A frame for the projection of cost patterns.

It is proposed first to present a description of the model, then to outline an ancilliary technique for the provision of future demand inputs to the model in the form of projected course enrolments by academic level. The utility of the model is thus extended to provide a means of forward budgetary exploration.

The basis of the model is the LEONTIEF type input/output matrix which distributes Departmental teaching costs among Courses in the proportion that student-hours are generated from Courses to Departments.

We use the following notation:

D_i, i=1....,m: the set of Departments administering Institute courses.

T_i, etc.: the set of total costs incurred by Departments.

C_j, j=1,2....,n: the set of courses offered by the Institute.

TCC_j, etc.: the set of total costs assignable to Courses.

K_j, etc.: the average number of class-hours per week prescribed for Course j.

Y_j, etc.: the number of years of study specified for Course j.

A: the m x n matrix of student-hour flows from Courses to Departments.

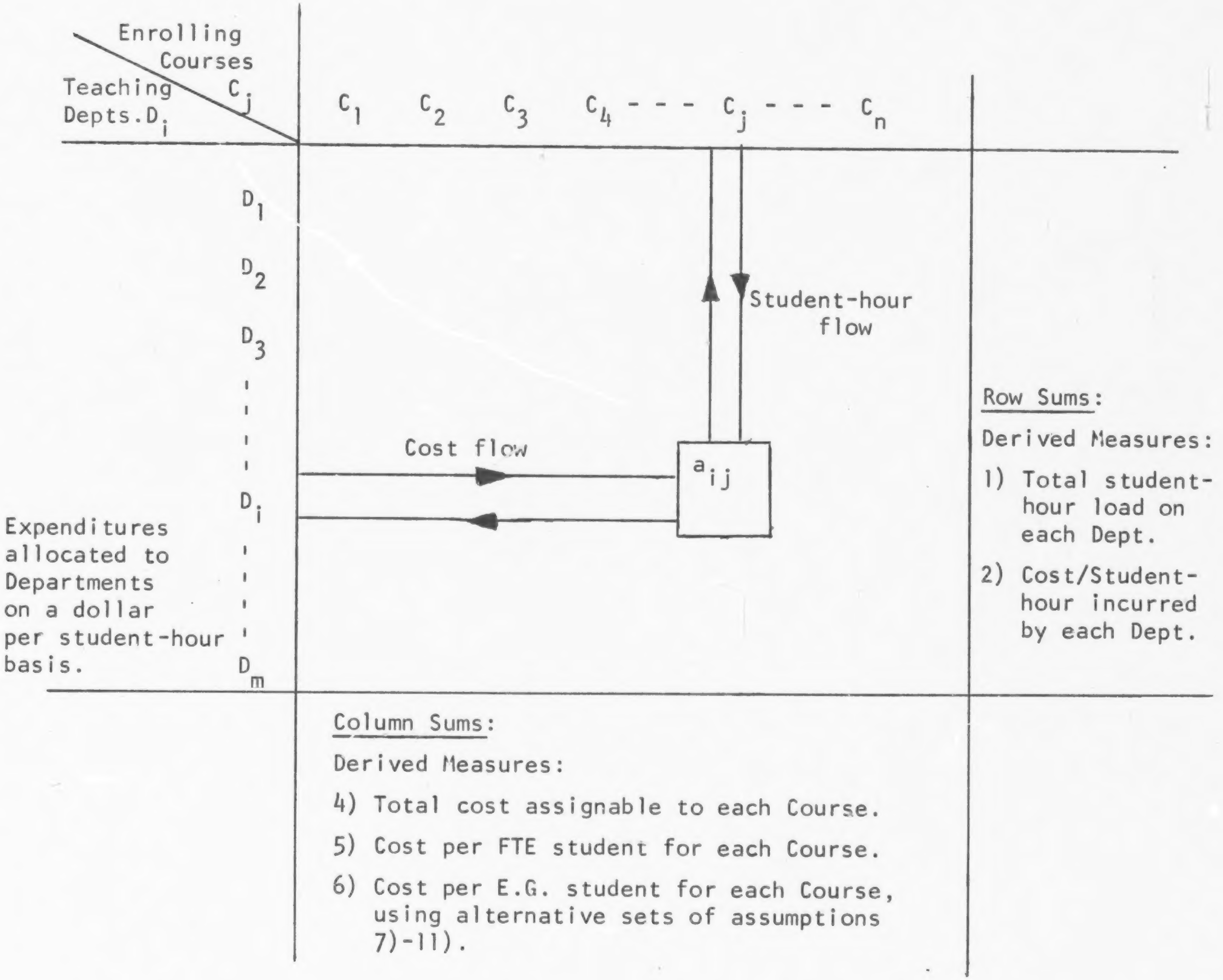
(a_{ij}): elements of A whose values are the number of student-hours generated from Course j to Department i. That is,

$$a_{ij} = \sum_{p=1}^{P} n_p d_p$$

where, n_p is the student flow from C_j to subject p taught by D_i, d_p is the duration in hours of subject p for p=1,...,P

SCHEMATIC REPRESENTATION OF MATRIX A

NOTE: Reference numbers, x), identify items listed under Row & Column Sums with following paragraphs bearing the same reference number.


Enrolling Courses C_j
Teaching Depts. D_i
C_1 C_2 C_3 C_4 - - - C_j - - - C_n
D_1
D_2
D_3
D_i
D_m
Student-hour flow
Cost flow
a_{ij}

Expenditures allocated to Departments on a dollar per student-hour basis.

Row Sums:

Derived Measures:

1) Total student-hour load on each Dept.
2) Cost/Student-hour incurred by each Dept.

Column Sums:

Derived Measures:

4) Total cost assignable to each Course.
5) Cost per FTE student for each Course.
6) Cost per E.G. student for each Course, using alternative sets of assumptions 7)-11).

The following measures are derived by matrix operations:

1) The total student-hour load (L_i) generated to D_i from all courses is,

$$L_i = \sum_{j=1}^{n} a_{ij}$$

2) The cost per student-hour CSH_i incurred by D_i is,

$$CSH_i = T_i/L_i$$

3) The reverse flow of costs from D_i to C_j is,

$$CC_{ij} = T_i \cdot \frac{a_{ij}}{\sum_{j=1}^{n} a_{ij}}$$

4) The total cost assignable to C_j is,

$$TCC_j = \sum_{i=1}^{m} \left[T_i \cdot \frac{a_{ij}}{\sum_{j=1}^{n} a_{ij}} \right] = \sum_{i=i}^{m} (CSH_i . a_{ij})$$

UNIT COSTS

DEFINITION 1

FULL-TIME-EQUIVALENT STUDENT. (FTE)

A theoretical measure of the number of full-time students enrolled in the particular Course is given by the total number of student-hours enrolled in the Course divided by the average prescribed weekly class-hour load of the the Course:

For Course j:

$$FTE_j = \sum_{i=1}^{m} a_{ij}/K_j$$

Comment: In the case of a part-time course, K_j is set equal to the average of all K_j for full-time courses administered by the Department administering the part-time course.

5) The cost per FTE for Course j is,

$$COST_j \text{ PER FTE} = TCC_j/FTE_j$$

DEFINITION 2

EQUIVALENT GRADUATE. (EG)

A theoretical measure of the number of graduates in a given Course and year.

For Course j:

$$EG_j = \sum_{i=1}^{m} a_{ij}/Y_j.K_j = FTE_j/Y_j$$

Comment: In the case of a part-time course, K_j is set as before (see comment Definition 1); Y_j is set at the average value for full-time courses administered by the same Department.

6) The cost per Equivalent Graduate in Course j is,

$$COST_j \text{ PER EG} = TCC_j/EG_j = Y_j\ (COST_j/FTE)$$

ALTERNATIVE COSTS PER E.G.

7) OPTIMUM $COST_j$ PER E.G.:

The total number of student-hours $\sum_{i=1}^{m} a_{ij}$ (hereafter denoted by Z_j) generated by Course j, and the total costs D_i incurred by Departments correspond to the assumptions of:

(i) Optimum utilisation of resources, namely space-time, staff and equipment, associated with Course j.

Comment: The complications involved in such an assessment are extensive. This type of exercise has been studied only in broad outline at W.A.I.T. It is regarded as a worthwhile study which should be conducted in proper detail.

(ii) No subject withdrawals subsequent to the finalisation of enrolments in Course j.

(iii) No examination failures in Course j.

8) POTENTIAL $COST_j$ PER E.G.:

Z_j is the total number of student-hours enrolled in, for Course j under assumptions (ii) and (iii) of para 7).

9) PRE-EXAMINATION $COST_j$ PER E.G.:

Z_j is the total number of student-hours corresponding to subjects examined, for students enrolled in Course j under assumption (iii) of para 7).

Comment: A distinction is made between students sitting for annual and deferred examinations and is applied where appropriate in the measurement of wastage (see para 12)).

10) POST ANNUAL EXAMINATION $COST_j$ PER E.G.:

Z_j is the total number of student-hours deriving from subjects passed at annual and supplementary examinations by students enrolled in Course j.

11) ACTUAL COST$_j$ PER E.G.:

Z_j is the total number of student-hours deriving from subjects passed at both annual and supplementary examinations by students enrolled in Course j.

12) MEASUREMENT OF WASTAGE:

Costs 7) through 11) provide measures of the component parts of total wastage in terms of costs per Equivalent Graduate. For example:

8) - 7):	wastage due to sub-optimisation of physical resources.
9) - 8):	wastage due to withdrawals.
11)-10)-9):	wastage due to annual examination failure rate.
9) - 10):	the value of the remedial effect of supplementary examinations. The reduction in cost per equivalent graduate may be compared against costs associated with the remedial sector of summer school activity.
11) - 7):	total wastage.

Wastage sources may be identified by a more detailed examination of the model at the course to subject level of disaggregation within teaching departments.

13) METHODS OF COST ALLOCATION TO DEPARTMENTS ON A TEACHING BASIS:

The report has so far dealt with the model as an instrument for the distribution of costs to study Courses once the expenditure incurred by Departments has been established. It is now proposed to outline the methods which are considered at the present time to be the most appropriate for determining Departmental teaching expenditure.

Subject costs are obtained by expressing outlays, under major classifications, as unit costs per student-hour and are then distributed to subjects taught.

13.1 Teaching Salaries:

Separately for each Department:

UNIT COST: $$\frac{\text{The aggregate of the class-contact-hour proportion of each staff members' salary}}{\text{Total student-hours taught by the Department}}$$

thence to student-hours taught for each course by the Department.

Separately for each Division:

UNIT COST: $$\frac{\text{The remainder of Departmental teaching salaries plus Departmental and Divisional Administrative and Other Overhead Costs}}{\text{Total student-hours taught by the Division.}}$$

13.2 Central Administrative and Allied Salaries:

UNIT COST: $$\frac{\text{Total Salary}}{\text{Total Institute Student-Hours}}$$

thence to student-hours taught for each Course by the Department.

13.3 Technicians' Salaries:

Separately for each Department:

UNIT COST: (Per laboratory student-hour)
$$\frac{\text{Total Technician Salary Outlay}}{\text{Total student-hours taught in laboratories}}$$

thence to student-hours taught for each Course by the Department.

13.4 Laboratory Maintenance:

Separately for each Laboratory (for each Department)

UNIT COST: (Per laboratory student-hour)
$$\frac{\text{Maintenance Cost}}{\text{Total student-hours taught in the laboratory}}$$

thence to student-hours taught in the laboratory for each Course.

13.5 Depreciation on Laboratory Equipment:
(10% flat rate per annum)

UNIT COST: as for laboratory maintenance.

13.6 Building Maintenance: (Cleaning, etc.)

Three percent of the initial capital cost of all buildings to be allocated annually.

UNIT COST: $$\frac{\text{Total Cost Allocation}}{\text{Total Institute Student-hours}}$$

thence to student-hours taught for each Course by the Department.

13.7 Consumables:

Each Department separately.

UNIT COST: $$\frac{\text{Consumable Vote}}{\text{Total Student-hours Taught}}$$

thence to student-hours taught for each Course by the Department.

13.8 Library Acquisition Costs:

According to Departmental Book Values

UNIT COST: $$\frac{\text{Departmental Vote}}{\text{Total Institute Student-hours}}$$

thence to student-hours taught for each Course by the Department.

13.9 Library Salaries: (and other overheads)

UNIT COST: $\frac{\text{Total Outlay}}{\text{Total Institute Student-hours}}$

thence to student-hours taught for each Course by the Department.

13.10 Depreciation on Major Equipment (other than Laboratory Equipment) & Minor Equipment:

(10% flat rate per annum)

UNIT COST: as for laboratory maintenance.

13.11 Building Depreciation:

(5% flat rate per annum)

UNIT COST: $\frac{\text{Total Allocation}}{\text{Total Institute Student-hours}}$

SUMMARY

Since FTE course enrolment figures, in contrast to Headcounts, are independent of full-time/part-time student ratios, it is clear that costs expressed in terms of FTE afford a more valid basis for comparison of course costs. Furthermore, the FTE figure *per se* is a more accurate measure of the workload imposed on resources according to the weekly class-hour load prescribed for the course.

"Equivalent Graduate" values are derived from FTE Course enrolments by dividing the FTE values by the duration in years of the course. Both EG and FTE values therefore possess the same desirable characteristics. The chief merit of the EG concept is that it provides a means of measuring annual production in individual courses and observing the economic effects of the various causes of production wastage. The model then provides the means of tracing and examining sources of wastage at the subject level.

Finally, the model possesses three useful features which should receive special mention:

Computer programming of the model could be suitably generalised so as to permit:

(i) easy updating of the model for the inclusion of new courses

(ii) effective functioning of the model throughout changes in the academic year structure.

(iii) It is possible that consequent upon policies of course liberalisation, demands for elective subjects may increase from year to year. The model would afford a means of observing the inter-departmental implications of such demands.

SECTION 2

A MODEL FOR THE PROJECTION OF COSTS

The immediate purpose of the WAIT cost analysis programme is to analyse historic costs in a way which will indicate the magnitude, type and direction of remedial action that may be necessary to counteract wastage in both dollar outlays and potentially useful students. the model which would facilitate such an analysis should also provide a frame for the projection of cost patterns on the basis of alternative hypotheses. This is necessary because of the long term nature of triennia planning and budgeting.

The model that has been described in Section 1 will supply such an analysis, together with the frame for projection, under the assumption that the distribution of student-hours from Courses to Departments remains approximately constant. However, such an assumption is probably only feasible in an idealised steady state system where enrolment proportions among academic levels are constant from year to year. It is therefore considered necessary to refine the method of establishing student-hour distributions in accordance with the proposed method of projecting course enrolment inputs.

Course enrolments would be projected by academic level within courses by the progressive loading of estimated annual new enrolments to a Markov Chain process describing student flow among academic levels (states). It is to be noted that the term 'academic level' is used rather than 'academic year'. This is done in order to overcome the anomaly caused by students who, subsequent to failures in their first year of study, enrol for subjects belonging to more than one academic year of the course. A student's academic level is defined as follows:

Definition:

A student is deemed to occupy academic level r, $r=1,2,\ldots\ldots,m$ until the student's number of accrued class-hours due to subjects passed or exampted is greater than the aggregate of weekly-class-hours prescribed for each year k of the course, $k \leq r$. For example, if the number of weekly-class-hours prescribed for the first and second years of a course are 26 and 25 respectively, a student will occupy academic level 1 or 2 as the case may be until he has accrued more than 26 or 51 class-hours respectively.

Base year distribution of student-hours would be established by recording hour flows from academic levels within Course j to subject p taught by Department i. Element a_{ij} of the previous matrix A becomes element a_{pjr} of a separate matrix A^i for each Department. The growth factor for academic level r in Course j would be applied to the column sum $\sum_{p=1}^{P} a^i_{pjr}$.

Let this equal Q. Q is the number of projected student-hours from level r Course j to Department i. The means of distributing projected Departmental costs to academic levels within Courses is thus provided on the assumption that the distribution of student-hours from academic level to subjects remains constant.

Of the expenditures listed in paragraph 13 of Section 1., the annual growth of those appearing in sub-paragraphs 13.3, 13.4, 13.5, 13.6, 13.7, 13.9, 13.10 and 13.11 could be expected to conform within acceptable limits of accuracy to a simple direct proportion relationship with student-hour growth. This may also apply for expenditure 13.8 but to a lesser degree. These assumptions may be considered as acceptable in the absence of more accurate relationships which could only be established over time.

The remaining expenditures, namely Teaching and Divisional administration salaries (13.1) and Central Administrative

Salaries (13.2), certainly could not be expected to grow in direct proportion to student-hours and it would be essential to derive functions describing their growth before the model could be used for cost projection.

As far as the problem of increases in administrative salaries in a rapidly developing institution is concerned, a combination of two approaches seems possible. First to project the growth of individual Branches of administration, the estimates to be based on known workloads and their expected growths, and on additional functions to which the branches may aspire and which should be viewed in the context of the whole pattern of administration. Secondly, to set an upper limit to the total administrative staff figure (and hence staff salary figure) based on comparisons with fully developed institutions, and assume a functional relationship of the GOMPERTZ or LOGISTIC type with total staff salary as the dependent variable and time the independent variable. The second approach should provide a guideline for the first.

In order to employ the model in the estimation of teacher salary and its distribution to courses, it is necessary to establish relationships, individually for Departments, between teacher salary and student-hours. To accomplish this it is first necessary to establish trend curves for the following variables:

(i) the average annual FTE teacher salary

(ii) the average class size associated with subjects belonging to academic year k within individual Departments.

We use the following notation to illustrate an estimation of teacher salary in the year t for Department i:

D_t : total Departmental teaching salary (excluding Department Heads)

N_t : the number of FTE teachers (excluding Department Heads)

CH_t^k : the number of class-contact-hours assignable to subjects belonging to academic year k

SH_t^k : the number of student-hours generated to subjects belonging to academic year k (obtained from the updated model)

$\bar{a}_t^k$: the average class size associated with subjects belonging to academic year k.

$\bar{a}_t^k = g(t)$, a function of time, established independently.

$\bar{d}_t$: the average annual FTE teacher salary.

$\bar{d}_t = f(t)$, a function of time, established independently.

$N_t \propto \sum_k CH_t^k$; $N_t = b \sum_k CH_t^k$ - - - (1) where b is a constant of proportionality obtained from records.

$CH_t^k = SH_t^k / g^k(t)$ - - - (2)

From (1) & (2),

$$N_t = b \sum_k (SH_t^k / g^k(t))$$

$$D_t = f(t) \; b\sum_k (SH_t^k / g^k(t))$$

Salary cost per Student-hour,

$$D_t/SH = f(t) \; b\sum_k (SH_t^k / g^k(t))/\sum_k SH_t^k \text{ - - - } (3)$$

Let r be an assumed monetary annual inflation rate:

Then cost per student-hour to be distributed to Courses in year t is obtained by multiplication of the terms on the right of equation 3 by $(1+r)^t$.

Clearly, the accuracy of the results of the above rationale depends largely upon the accuracy of the predicted values for average class-size and teacher-salary. Some preliminary work towards establishing such trends at WAIT has been performed but the surface of the problem has scarcely been scratched.

Regarding the forecasting procedures as a whole it will be seen that the following parameters may be varied in accordance with Institute goals thus producing alternative cost patterns:

(i) Increased pass rates and/or decreased withdrawal rates may be simulated by adjusting the Markov Chain transmission rates among states.

(ii) Entry rates to courses may be controlled by suitable organisation of projection techniques for new enrolments (not treated in this report).

(iii) Average class-size may be varied in accordance with changes to tuitional patterns, or physical resources.

(iv) Average teacher salary may be varied so as to reflect tightening market situations, or vice versa should such an assumption ever seem feasible.

In summary, it may be pertinent to comment that the forecasting system described should prove to be an effective aid to domestic efficiency and decision-making. However, its effectiveness in assisting the Institute to operate in its broader role of maintaining a balance between the demands of final year secondary students and of industry will probably be restricted until more is known about the relative demands of the latter.

CHAPTER 3

FINANCE AND COSTS: SUMMARY AND RECOMMENDATIONS

3.1 PROGRAMME PLANNING BUDGETING SYSTEM

It is recommended that the Council of the Western Australian Institute of Technology authorise for 1973 a trial application of the Programme Planning Budgeting System (PPBS) and that the result of such a trial be published for the guidance of other higher education institutions.

It is recommended that the Department of Education and Science consider, in conjunction with its advisory bodies, the applicability of the Programme Planning Budgeting System to national and regional planning in relation to the needs of education.

A number of detailed discussions was held on the Programme Planning Budgeting System[1] during the study tour. The main countries involved were the United Kingdom, Canada and the United States. My view after these discussions is that the Programme Planning Budgeting System is potentially a valuable management tool but as yet it remains unproven, largely because of the lack of practical experience so far gained. The latter is due to an apparent reluctance for experimentation, although far more is now being undertaken by a number of countries and institutions. To date Australia has given very little consideration to the system but it may well be that this attitude will change in the course of the next few years.

A member of the academic staff of the Institute's Accounting and Business Studies Department is currently undertaking a thesis approach to the applicability of the Programme Planning Budgeting System to a single institution.

The objectives of the system can be identified as:

- the definition of objectives
- the in-depth analysis of existing and proposed programmes in terms of costs and benefits
- the linking of annual planning and budgeting to multi-year plans
- the measurement of actual and planned performance
- the systematic integration of the above elements into a system for the allocation and arrangement of resources.

If the Council accepts the recommendation, I would advocate one or more of the following methods of application:

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[1] Originally developed by the Rand Corporation and applied to U.S.A. defence departments by Robert McNamara, and subsequently to other U.S.A. government departments

(a) the use of PPBS alongside the present and largely traditional budgeting system for some specific resource-consuming centres, such as the library[1] and/or a group of teaching departments

(b) only the theoretical use of the system for the whole Institute for a year's trial before actually using the system for decision-making

(c) the full application of the system to an area of decision-making, which can be easily isolated from the budgets and costs of the whole Institute, such as the School of Mines or the Muresk Agricultural College.

PPBS is a complex procedure; accordingly, for those interested in its potential application to education, I have selected a number of related documents which appear in Appendix B.

3.2 MANAGEMENT INFORMATION SYSTEMS AND DATA BASES

It is recommended that the appropriate Commonwealth and State instrumentalities should study in detail the objectives and guidelines of the Western Interstate Commission for Higher Education (WICHE) in the United States in order to assess its applicability to Australian conditions and circumstances.

WICHE is a regional co-operative project among higher education institutions and co-ordinating agencies to design, develop and implement management information systems and data bases, including common uniform data elements. The project objectives[2] are as set out below:

"...The rapid growth in size and complexity of higher education has highlighted the need for systematic collection and use of data in the effective management of colleges, universities, and state systems of higher education. Without systematic, accurate feed-back to management of the effects of its operations, an institution or system can waste its resources on ineffective or unnecessarily costly activities. Judgements about effectiveness and relative costs, however, cannot be adequately made in isolation. Hence, the need also for comparable data from other organizations of similar complexity and with similar missions.

In meeting these common needs, state co-ordinating agencies and concerned colleges and universities in the West have asked the Western Interstate Commission for Higher Education to bring together a highly competent staff to assume a regional leadership role in

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[1] The Massachussets Institute of Technology has decided it is feasible to develop a meaningful PPBS for library operations: See - J.A. Raffel & R. Shishko: Systematic Analysis of University Libraries, The M.I.T. Press, Cambridge, Mass., 1969

[2] Objectives and Guidelines of the WICHE Management Information Systems Program, Western Interstate Commission for Higher Education, Boulder, Colorado, May 1969

1) designing, developing and implementing management information systems and data bases including common data elements at local and state levels including community colleges, universities, and higher educational agencies, both public and private in the West.

   The purpose of the information systems and data bases will be:

   a) To significantly improve the capability of local institutions and agencies to more effectively allocate resources.

   b) To provide the co-operating organizations, on a continuing basis, comparable data from throughout the region and elsewhere on the cost of instructional programs by level of student, level of course, and field of study.

2) A concurrent objective will be to begin the task of identifying higher institutional input-output indicators both quantitative and qualitative and relating varying educational costs to such indicators.

   At the request of the co-operating organizations, the initial phases of this project will be concerned with establishing a preliminary set of common data elements, program elements and program element grids, program budget categories, and quantitative indicators; designing and implementing compatible information systems which will provide uniform data from which can be derived the costs of instructional programs by level of course, level of student and field of study. To be eligible for inclusion in the project, institutions must be willing to co-operate in these activities.

Subsequent phases of the project will be devoted to:

1) The refinement of information systems and data elements, input-output indicators, and cost relationships of the instructional program.

2) Beginning the task of identifying input-output indicators of research and external service programs.

3) Disseminating information about the project beyond the region and to develop procedures whereby, at an appropriate time, institutions and agencies outside the western region can profitably benefit from participation in the project.

The following missions are essential to the successful achievement of the project objectives and purposes and will also be undertaken by the project staff:

1) Stimulating, co-ordinating and conducting educational programs at various levels for all institutions and agencies who wish to develop their capability to co-operate in this project. This will include inter-

and intra-campus utilisation seminars in systems analysis, operations research, program budgeting and cost-benefit analysis; the use of simulation models for high-level management training in the use of these decision-making tools under a variety of institutional circumstances; the publication and distribution of staff technical reports developed in the process of establishing data definitions, program elements, system applications, input-output indicators, and program budget categories.

2) Co-ordinating development of data elements and information systems at the regional level with similar efforts in other regions and at the national level.

3) Co-ordinating the exchange of comparable higher education management data among the co-operating agencies and institutions in the West, at their direction."

3.3 FORMULA BUDGETING

It is recommended that the Department of Education and Science give consideration to the desirability or otherwise of introducing formula budgeting, along the lines practised in the Canadian province of Ontario, as a method of making triennial recurrent and capital grants to universities and colleges of advanced education.

It is recommended that an investigation be made in the Western Australian Institute of Technology as to the possibility of introducing formula budgeting within a single institution as a means of resources decision-making to academic divisions and departments.

Formula budgeting in Ontario has received a mixed reception, with its critics asserting that it has forced universities into seeking growth in student numbers (and then in financial allocations) to the detriment of the quality of education. However, the Provincial Government considers the system has achieved, e.g. (a) more equitable distribution of funds, (b) greater economy by institutions in the use of resources and (c) more innovation and experimentation within universities.

The proposal made for formula budgeting to be introduced into a single institution, i.e. the Western Australian Institute of Technology, is being applied in single Canadian institutions. It would not be necessary to introduce the system in one major effort, but rather experiment with it in a series of co-ordinated steps, as, e.g.:

(a) the gradual introduction of more flexibility in transfer of resources between budgetary allocations to divisions and departments

(b) the introduction of staff:student ratios as a method of establishment of academic and technical staff members, after investigations in depth into each department

(c) the ultimate introduction of a system of giving unit values to each course and year of study, and then the assessing of a unit value for each course, with the budget being calculated by the formula of student units x unit value.

In the latter case, full flexibility of resource allocation would be available within the total sum voted to a department. At the beginning of each academic year (or semester) the number of student units would be corrected from projected to actual. The control mechanism would be a form of output measurement.

Formula budgeting for recurrent expenditure is a significant device. It is explained in detail in Appendix C.

Appendix D relates to capital, and it should be noted that the formula for capital budgeting is interim and subject to revision in depth, after the accumulation of experience.

3.4 COST ANALYSIS TECHNIQUES

It is recommended that the Commonwealth Advisory Committee on Advanced Education give consideration to requiring from all Colleges of Advanced Education as from the fourth triennium, the inclusion in institutional submissions of the following data:

Drop-out statistics, together with explanations

Examination pass/fail statistics

Cost per full-time equivalent student (both historical and projected)

Cost per equivalent graduate (both historical and projected).

It is recommended that such information be published, together with the comments of the Commonwealth Advisory Committee on Advanced Education and the individual Colleges of Advanced Education.

It is recommended that the Commonwealth Advisory Committee on Advanced Education give consideration to suggesting to the Australian Universities Commission that it discuss adopting a similar policy for universities.

The reasons for the above recommendations are:

(a) such data is essential for decision-making in the allocation of resources

(b) the data is objective and measurable, and should be used in conjunction with subjective opinion concerned with quality

(c) the institutions would gain insight into their own operations through the dialogue which would result from the comparative data

(d) the public is entitled to such information as part of the democratic process.

3.5 CO-ORDINATION BETWEEN CAPITAL AND RECURRENT PROGRAMMES

It is recommended that the Commonwealth Advisory Committee on Advanced Education give consideration to ensuring that submissions for triennia specifically prove that recurrent programmes are in line with capital programmes.

Whilst overseas I observed many institutions where capital and recurrent programmes were not in step, and this caused serious dislocations for government and institutions alike.

A programme which ensures that projected recurrent and capital budgets are compatible requires that key resources (such as classroom and office space, equipment, teaching and support staff and community services) are each calculated from projections of closely related parameters.

Methods being used at the Western Australian Institute of Technology are summarised below:

For the Third Triennium, the technique was to estimate Departmental teaching space, staff and equipment requirements using projected hours of class contact and distributions of hourly class-size. Student-hour growths were derived from these parameters and applied to 1970 data in the projection of consumables and other similar budget items. Student-hour figures were employed, where necessary, to determine the intensity of equipment usage.

The above parameters were established by the application of existing or proposed tuition patterns to estimated subject enrolments. These latter were projected in turn from 1971 data using growth factors supplied by projected student enrolments in individual course levels. Car-parking and Cafeteria requirements were estimated by again applying present or assumed utilisation patterns to projected student enrolments.

All estimates were thus validly connected to student enrolment projections in individual courses by parameters whose inter-relationships were well established. Initially, a general guideline had been set by a total Institute enrolment projection on demographic principles.

The Institute has developed significant techniques for forward projections and planning; these are expounded in detail in the submission for the Third Triennium 1973/1975. It has begun work in an integrated system of planning, involving, e.g. educational objectives, projections of staff and students, capital and recurrent expenditures, the measurement of labour demands and the latter's relationships to higher education. A draft proposal is likely to be made to the Institute's Council later in 1971.

3.6 LONG-TERM FINANCIAL AND PHYSICAL PLANNING

It is recommended that the Department of Education and Science give consideration to the investigation of the type of work being carried out by the Systems Research Group of Canada on long-term financial and physical planning.

The major system is known as Connect/Campus system and the following list of models gives an appreciation of the type of work being carried out.

Type of Model	Connect/Campus
Aggregate Post-Secondary Institution Model	October 1966: The CAMPUS II Model of the core campus in the University of Toronto was operational
Disaggregate Post-Secondary Institution Model	November 1967: CAMPUS III used to simulate the Health Sciences Faculties at the University of Toronto was operational, operating on an individual course basis or any aggregation thereof.
Community College Model	September 1969: The CAMPUS Community College Model was operational in three community colleges as of that date. It is now being extended to twenty-two more.
Private College Model	September 1970: A pilot implementation of a private college version of the CAMPUS model is presently underway at Wheaton College
State System Model	October 1970: An implementation program involving the adaptation of CAMPUS to a state system is taking place for two state systems.
Medical School Model	September 1967: A second version is now being worked on for implementation at Duke University Medical School.
Model of Institution using a Complete Individualized Instruction Program	September 1970: An adaptation of CAMPUS to a college that is using completely individualized instruction program with no classroom instruction is being implemented for Hostos College.

A considerable amount of detail on the system is shown in Appendices E and F.

CONCLUSION

In Chapter 1 a number of observations were made on the necessity to improve productivity in higher education. The following further quotations may assist to emphasise these points and to reinforce recommendations made earlier in this chapter.

I commence with quotations from an address given by Dr. F.E. Balderston of the University of California at an Organisation for Economic Co-operation and Development Conference held in Paris in 1969.

"...A brief review of the planning instruments and mechanisms now in use in the University is necessary as background to current developments. Each campus of the University has an academic plan which expresses its official expectations as to future schools, colleges and programs and year-to-year projections of undergraduate and graduate enrollment (co-ordinated through the Office of the President with the enrollment projections throughout the system). The campus academic plan generally spells out goals the campus seeks to realise and the specifics of organisational style and other attributes that its chancellor and faculty seek to achieve. But the timing of various steps along the way is subject to fiscal constraints, both on the operating and the capital side which arise in the University-wide budgets. Closely linked to the campus academic plan is its Long-Range Development Plan, which indicates the physical lay-out and future facilities of the campus.

The University-wide academic plan, like the campus plans, is updated periodically and approved in principle by the President and the governing board. This plan contains the approved University-wide enrollments, both undergraduate and graduate, by year for ten or more years, and it spells out the major parameters of growth and program development for the University as a whole.

Neither the campus academic plans nor the University academic plan contains resource requirements and priorities. The University's Long-Range Fiscal Program has been developed to provide, in broad functional categories, the projections of capital and operating funds required over a ten-year interval to realise a path of growth consistent with the enrollment projections.

Much more detailed, intermediate-range budgets are prepared annually for a five-year horizon. These budgets, approved by the governing board, represent the University's request for funds from the California State government, and its forecasts of the funds that will be forthcoming from other sources.

The State acts only upon the first year of these five-year cycles, and it customarily takes separate funding action, through somewhat different review procedures, for the capital budget and the operating budget.

If it were invariably possible to realise the totals of of operating and capital requirements in the projection of requirements, and provided that the budgetary factors which determine the components of the projection are adequate, then one could say that resources had been adequately specified for the path of growth. But the situation is more complicated than this, not only because the totals of capital and operating support from the State and from other sources diverge from the projections, but also because the review processes result in agreements to delete specific items of new program or functional support.

It thus becomes necessary to approach the process of co-ordination in new ways, so that program priorities and the timing of their capital and operating support will be more directly subject to policy decisions and adjustments. This need for improved co-ordination has stimulated development of new planning instruments and has also increased the urgency of analytical work.

Program Budget and Program Review

In order to bring about improved co-ordination, the University is in the process of moving from a function and performance budget to a program budget. The California State government has pressed each agency and instrumentality of the State to adopt a program budget format for the 1970-71 budget cycle, and the University is now preparing such a budget.

There are three major programs, each with its own measures of output: instruction, sponsored research, and public service. Three supporting programs are identified: libraries, administration, and supporting services. Each of these programs and the subprograms within it is defined as a cost and budget category. A practical achievement of major proportions is the writing of a computer program to translate from the existing budget accounting codes to the new format. This computer routine is now operative.

Each major program and each supporting program is broken into subprograms. The instructional program and sponsored research are broken into discipline categories. Level-of-activity indicators are defined for each of these---one of the obvious ones being the amount of enrollment by discipline major. Identification of the costs of each subprogram within the instructional program is a major issue. I shall return to this subject in discussing the cost simulation model."

"...The University of California Cost-Simulation Model

This model was first developed three years ago as an experiment in tracing and estimating the costs of academic programs by discipline and by level of student. There are three basic problems in such cost-tracing: identification of the costs associated directly with a given program; use of data which make it possible to estimate induced costs of the program; and use of rules for the allocation, where necessary, of joint costs. It is the practice in most American universities that the student enrolled in a given program may take instruction not only in courses within his major discipline, but also in many other fields. For most of the general campuses of the University, the statistical records of class enrollments have now been compiled so as to serve as input to the cost-simulation. The tracing of induced instructional costs associated with the number of students in a given discipline is a major achievement of the cost-simulation model.

With this model, it has been possible to estimate the costs, as of the existing pattern of activities in each discipline, of providing a year's education to a student who is a candidate for a B.A. degree or a Ph.D. degree in a given broad discipline area. Eleven discipline groups were used in the original construction of the simulator. Both operating costs and imputed physical facilities costs are estimated.

The cost-simulation model has shown that the annual cost per student varies enormously by discipline, and indeed, that the cost per student in some undergraduate degree majors is higher than in some Ph.D. programs. By combining the unit cost estimates from the cost-simulation model with data on graduate persistence and attrition, we have derived estimates of the net cost per degree achieved in various disciplines. While the costs per year are very high in the laboratory sciences and engineering, the far greater rates of persistence to the degree in these fields give rise to the conclusion, based on the assumption that the student who drops out is an unrequited investment, that the net cost to the institution per Ph.D. degree granted is actually higher in some humanities fields than in some of the sciences.

We are not entirely satisfied with the way in which the cost-simulation model performs some of the cost allocations that are necessary in the estimation process. We expect that a number of refinements will be possible from the new efforts at program costing associated with the program budget and that these will enable us to do a sounder and more accurate job.

I am certain that we will continue to need a flexible and fast-operating frame for estimating the cost consequences of alternative patterns of growth and alternative policies. While further refinement will be most welcome, we already feel that results such as that cited above provide valuable insights. This is true even though we know that we are not dealing with average or marginal costs under conditions of optimal cost control and resource allocation: in fact, the differences in cost-rates, linked for the first time with data on persistence and attrition, cause us to raise questions about the desirability of shifting away from the present cost patterns in order to obtain improvements."

At another conference in Paris, 1969, organised by the Organisation for Economic Co-operation and Development, Professor John Vaizey said as follows:

"...First, the educational system with its multiple objectives and levels of decision-making has a special need of techniques such as cost-effectiveness analysis for the evaluation of its programmes, and for budgeting systems which make these possible. Furthermore, many of the objectives of education are by their nature very long term and budgetary decisions often have long term implications, whereas public authorities are unwilling to make long term budgetary commitments. This makes the setting of objectives and the planning and implementation process a particularly complex task in which budgetary procedures have an important role to play.

Secondly, programme budgeting and cost-benefit analysis are important for organising thinking about relationships between objectives and their implementation.

Thirdly, it is important to adopt a budgetary procedure that allows a periodic review of total programmes, as opposed to an annual budgeting procedure in which very large proportions of expenditure (and in education this may well be 98% of the expenditure) are already, in fact, committed.

Fourthly, a number of models and formal budget structures exist for programme budgeting in education at various levels of administration and attention should be given to the provision of some specialised training to economists and others who have the necessary intellectual background.

Fifthly, budgetary procedures and structures and administrative and planning procedures and structures are closely linked, and there is a major need for innovation and flexibility in both, so that complementary and conflicting objectives become apparent. They can be readily evaluated and incorporated within the budgetary system.

Sixthly, emphasis was laid on the importance of analytical studies to provide information relevant to the programme budgeting system."

CHAPTER 4

THE AUSTRALIAN EQUIVALENT OF THE BRITISH OPEN UNIVERSITY: SUMMARY AND RECOMMENDATION

4.1 RECOMMENDATION

It is recommended that the Department of Education and Science consider the desirability and viability of an institution being established in Australia, along the lines of the Open University in the United Kingdom. Such an institution would include provision for students seeking external degrees, technological degrees and diplomas, provide for continuous education, and operate in full co-operation with the states and existing tertiary education institutions.

4.2 After travelling and talking to educationists and administrators in many countries in Asia and Europe, I have little doubt that the most interesting development in higher education which I encountered on my Study Tour is the establishment of the Open University in the United Kingdom.

Before visiting the University headquarters in a small village, which is to become part of the new city of Milton Keynes, I had heard some praise and much criticism. That the Open University has influential opponents is painfully obvious. Anything as radical as creating an institution to cater for adults, many without the formal entry qualifications required by traditional universities, is bound to encounter some hostility. The latter is further increased by the new University's teaching methods being more in keeping with the true needs of modern society.

The basic instruction is conducted by correspondence and the use of specially written textbooks. It is supplemented in a variety of ways, including television and radio programmes from B.B.C. channels, taped lectures, audio-visual materials, face-to-face tutorials at an astonishing number of regional study centres throughout the British Isles, and an imaginative use of counsellors to handle not only the academic but the personal problems of students. In addition, computers are beginning to play a major role with the co-operation of educational computer centres, the P.M.G. and the major data-processing companies. Another teaching aid that surprised me was the development of a home-study science kit with which it is claimed a student will be able to carry out all laboratory experiments necessary in a basic science course. Some of its components are likely to be patented.

In 1971 the University commenced teaching with an intake of 25,000 students scattered through the United Kingdom. Great care has been taken by the admission controllers to achieve balance between geographical regions, courses of study and the occupation groups.

At the time of my visit to the Bletchley headquarters (on which there is now a capital investiment of £5,000,000, whereas eighteen months ago there was only a manor house and ploughed fields), it was not known how many accepted students did not have the normal entry qualifications. However, it was thought that it could be at least 50%, and it was known that only 5% of the 25,000 students already possessed a degree.

The general philosophy of admission places a heavy emphasis on teachers and housewives, who together have taken 10,000 places for 1971. This is in line with the view expressed by a senior administrator that the two occupation groups which play the major role in shaping new generations, and thus society, are schoolteachers and mothers.

Advantages of the Open University would appear to include:

* the University's capital costs will be significantly lower than for a traditional institution

* even if the proportion of students graduating was only 20% (and it is likely to be much higher), the recurrent costs per graduate would only be half that of a residential-type university

* its students remain in the workforce, thus continuing to contribute to national productivity, whilst improving their knowledge and qualification

* the adult (a student must be over 21 years of age) who missed the chance of higher education now has an opportunity to rectify the situation or seek a new career

* the full cost of tuition fees for the whole graduate course will be only £150 to £180, which is far lower than the normal

* the essence of selection to the University is capacity and potential, rather than a piece of paper obtained in the teens

* the implementation of a less restrictive entry policy and the positive catering for the adult part-time student will lead to easier retraining, and additionally bring to the nation both economic and social benefits

* greater use will be made of facilities in established institutions, not only for tutorials but also for week-long summer schools, which all Open University students have to attend in their first year

* there will be spin-off to the whole community as non-studying listeners take an interest in broadcasts and telecasts

and * at long last, a major university will be actively involved in the application of the new technologies in education, which in time may encourage the more traditional institutions to experiment more widely.

At present, the Open University is steering a middle-of-the-road course in many matters which are now under active debate amongst academics and students. Even though it is revolutionary in many ways, the newcomer must firmly establish itself, particularly by proving the quality of its graduates, before reaching out towards more and more radical experiments in the learning and teaching process.

Nevertheless, the staff of the University are full of ideas for the future. Many of them are challenging the shibboleths of tradition. A young professor told me that the greatest danger in education was the constant labelling of students: this one is lazy, the other is unable to understand. The point, in his view, is to get to the root of the students' problem: once a principle is understood it is far better remembered than any recall feats of facts and figures. Education is a base for self-development and not an end in itself. The examination system is a test of the ability to regurgitate, and nothing more: by no means does it measure understanding and potential.

4.3 ARGUMENT AND SKELETON PLAN FOR AN AUSTRALIAN EQUIVALENT

Australia is a big country in which 56% of the population live in the five mainland capital cities. A general picture of the population distribution within Australia can be formed from the following data:

62% live in cities of 100,000 and over
3.2% live in towns of over 50,000 and under 100,000
3.8% live in towns of over 20,000 and under 50,000
8% live in centres of over 5,000 and under 20,000

and thus 23% live in very small communities or in rural areas.

A quick analysis of these figures reveals that nearly 7 out of every 20 Australians live in sparsely populated areas or in towns which are generally difficult to service through adequate higher educational institutions.

Turning for a moment to age distribution, it is found that nearly 40% of the population is under 21 years of age. In the bracket of 17 to 21 years of age, i.e. the pool for immediate post-secondary education, we find that 8.75% is involved. In numbers, this would be about 1,110,000. According to the most reliable figures I have been able to obtain, the actual number of the age group in higher education in 1971 is about 178,000. Thus, of the age group concerned, 16% appear to be receiving higher education.

The figures for Western Australia in 1970 have been analysed. Enrolments from the metropolitan area of Perth in higher educational institutions were 82% of the total, as compared to Perth having 67% of the population. Enrolments from country areas were 18% of the total, as compared to areas having 33% of the population. The per capita disadvantage factor for the country thus is of the order of 1 to 2.

Taking the analysis further, 6.5 out of 20 Western Australians live in sparsely populated areas. It would therefore be necessary, if equal opportunity was a reality, that in 1971 out of the 9,000 enrolled in higher education and between the ages of 17 to 21, for 3,000 to be from the small population centres. The actual number is about 1,200.

The facts and figures stated have two essential purposes, namely:

* to show that people living in small towns and the rural areas are at present disadvantaged in the obtaining of higher education.

and * the total number receiving higher education is not impressive and may well be significantly below the percentage necessary in a rapidly developing nation.

As a sharp reminder of our relative position amongst the advanced nations, it is cogent to realise that in Western Australia, 73% of high school students leave before reaching the leaving certificate or matriculation year.

The Australian Council for Educational Research has recently analysed the number of 16 and 17 year olds in secondary schools. The figures for the various states are as follows:

Victoria	45.5%
South Australia	38.9%
New South Wales	36.6%
Tasmania	28.5%
Western Australia	27.1%
Queensland	19.4%

In the same report, the percentage of 19 year olds in full-time study at a technical college, college of advanced education, teachers college or university, were given as follows:

Victoria	12.4%
South Australia	10.8%
New South Wales	9.0%
Western Australia	8.3%
Tasmania	8.2%
Queensland	7.5%

These sobering facts have to be considered against a background of changes in society. At the beginning of this century, primary industry predominated, only to be surpassed easily by secondary indsutry, whether the measurement is made in employment numbers or the production of wealth. In the last decade, a significant shift has begun to knowledge industry, and in my view this will become the core of economic society before the turn of this century. Knowledge will supplant skill and brawn as the essential economic determinant. Since the end of the second world war, in the United States of America, and Europe, both primary and secondary industry have shown a relative downturn in the percentage of the population employed, whilst the knowledge industries have vastly increased both in percentage and absolute numbers. To make clear the meaning of knowledge industry, the following are examples: computing, space technology, cybernetics, research laboratories and educational institutions.

A proposal is made for an Australian equivalent of the British Open University. Additional background on the latter may help. It provides higher education to people over 21 years of age who have not necessarily completed the normal entrance requirements. It uses an integrated structure based on correspondence lessons and assignments, tapes and specially written textbooks with television and radio as teaching aids. In addition, it has hundreds of regional study centres, staffed by counsellors and tutors and it works in co-operation with existing institutions of higher education. Course tutors are responsible for grading and commenting on students' written assignments, for replying to queries about students' work and for conducting face-to-face tutorial classes at local study centres. The counsellor's main responsibilities are to give study advice to the students assigned to him and to help to organise discussion groups in a local study centre. It may educate as many as 250,000 people in the '70s at not more than half the operating costs of traditional institutions, and with insignificant capital costs if measured on a basis of student numbers. This is an appropriate time to point out that there are very high capital costs involved, for example, in the provision of a tertiary educational institution catering for 250 full-time students. A minimum capital cost is likely to be of the order of $M2, whilst operating costs of small institutions in remote areas could well be at least 25% more expensive than would be normal in a capital city. Furthermore, it must be appreciated that the quality of education is unlikely to be as high, because the small institution is handicapped in being unable to provide adequately for services such as library, counselling and educational technology.

The objectives of a similar Australian institution could be defined as:

* the teaching of programmes for degrees and diplomas for school-leavers, outside major centres of population, and for older people not possessing formal entry qualifications but judged to have the potential to succeed

* continuous education for the population as a whole as a side benefit obtained through the use of television and radio, supplemented by public lectures and discussion groups.

The methods of operation could be along the following lines:

* education through correspondence lessons, audio-visual aids, specially written textbooks, telephone hook-ups, direct telecasts and broadcasts, films and cassettes

* these would be supplemented by short residential courses in existing institutions, during vacation recesses and, most importantly, by regional study centres, staffed by academic counsellors and tutors. (It is to be noted that the short residential courses would be intensive, of at least a fortnight's duration, and would require the full co-operation of employers, motivated by their own interests and those of the students and the nation)

* a national headquarters, backed by a series of regional administrative centres, working closely with existing institutions and such authorities as the A.B.C.

The advantages which might flow from the establishment of such an institution include:

- the bringing of higher education to the sparsely populated areas
- easier opportunities for the adult to study
- a contribution to the growing need for continuous education
- the avoidance of high capital and operating costs, whilst simultaneously increasing the percentage of the population receiving higher education
- and * more adequate educational preparation for the knowledge society which may be closer to achievement than we realise.

As always with a radical idea, there will be sceptics. Many will say 'let's wait and see if the British Open University works'. A reply to this type of reaction has several aspects of which the most important are:

- the planning of such an institution would take not less than five years
- an early start to planning would enable Australia to work closely with the British institution
- and * the need for such an institution will not decrease in the next decade, but increase - and thus the time to begin is now.

To assist assessment of the proposal, two maps are illustrated in Annexures 4/I and 4/II at the end of the chapter. One gives the population distribution of Australia and the other is an early attempt to show how the Australian institution might be organised. It is emphasised that the regional study centre map is to be regarded as indicative rather than definitive.

It is important to realise that a large number of the centres are based on existing institutions, which currently are used for teaching for only between 30 and 40 weeks a year. Greater use can be made of existing institutions, without capital cost, although extra staff would be needed. The map calls for the establishment of regional study centres in many places where there is no existing tertiary institution. Such centres would not need to be elaborate, requiring only a few offices and some tutorial rooms, However, it would be advisable for them to be staffed by highly competent tutors and counsellors, and to be excellently equipped.

A serious problem requiring solution would be the provision of adequate library facilities. The major regional centres would need strengthening, but in addition the nation would have to decide on big increases in public library collections and the establishment of more branch libraries in small population centres. The size of this problem should not be underestimated, but in an era where knowledge is exploding Australia has little alternative but to totally rethink its attitudes to libraries. Libraries, in this context, are to be regarded as learning resource centres, involving not only books and journals, but also tapes, records, films, cassettes and slides.

Realising that evidence from overseas is often - perhaps too often - dominant in Australian thinking, the opportunity is taken to quote from American and Swedish documents, in support of the proposal.

In the United States of America, there is a Union for Experimenting Colleges and Universities, which is pioneering a 'University Without Walls.' The following is an extract from a document issued in September, 1970:

"...The University Without Walls abandons the tradition of a sharply circumscribed campus and provides education for students wherever they may be - at work, in their homes, through internships, independent study and field experience, within areas of special social problems, at one or more colleges, and in travel and service abroad. It abandons the tradition of a fixed age group (18-22) and recognises that persons as young as 16 and as old as 60 may benefit from its program. It abandons the traditional classroom as the principal instrument of instruction, as well as the prescribed curriculum, the grades and credit points which, however they are added or averaged, do not yield a satisfactory measure of education. It enlarges the faculty to include knowledgeable people from outside the academic world and makes use of various new techniques for storage, retrieval and communication of knowledge. It places strong emphasis on student self-direction in learning, while still maintaining close teaching learning relationships between students, teachers and others. It aims to produce not "finished" graduates but life-long learners. Moreover, the program is so organised that it promises in time to reduce the costs of higher education, without impairing (and we believe in fact increasing) quality and standards of student undergraduate educational programs."

An extract from a Swedish report reads as follows:

"...From the equality aspect it is urgent in the short-time view to steer the new resources to the field of adult education. This means that the allocation of resources to youth education cannot continue to increase at the same pace as hitherto. Adult education is required not only now, but to compensate the generations who did not benefit by the extended youth education; a great need for adult education will exist even when all have received 11 - 12 years of schooling.

In a society undergoing rapid change and with a rapid growth of knowledge, different forms of supplementary education after entry into a career bring greater opportunities for cultural activities and an understanding of social developments and the means to affect them. These means must be open to all. Increasing numbers of people will discover that the education they have received is inadequate. They will then wish to have further education in order thereafter to return to more interesting and better paid work, or quite simply for an enriched personal life. In this way the demand will emerge for a system of constantly recurrent education, an alternation between education and a job."

A few further pertinent points are added:

- The Australian Broadcasting Control Board has informed me that television can now reach 98% of the population, whilst radio is virtually a full coverage.

- Interestingly, the British Open University acknowledges that some work carried out in Australia for external students has played a part in their plans. Indeed, Australia pioneered some excellent techniques but at present these have not been followed through to the appropriate conclusion of really bringing higher education to all the people.

- In the next decade, higher education probably has to double its input and output, and using existing traditional methods, Australia may not be able to cope.

It may well be that the problems of improving the quantity and quality of higher education, of more effectively aiding the sparsely populated areas, of providing continuous education, and of preparing for the advent of a knowledge society, are such that only a new and radical approach will succeed. The proposal, in my view, has sufficient strength for it to warrant a Commonwealth committee of investigation.

4.4 A DETAILED ACCOUNT OF THE BRITISH OPEN UNIVERSITY

The most detailed account which has been given to date on the Open University is contained in a paper delivered at a UNESCO Conference in Paris in October 1970. It was written by the University Secretary, Mr. A Cristodoulou and the Director of the University's Institute of Educational Technology, Professor D.G. Hawkridge. With their permission, the full paper, entitled "The Open University of the United Kingdom and its Instructional System", is quoted below:

"1. Introduction

1.1 The Open University was established by Royal Charter on 30th May 1969, as an autonomous university. Its objects, as defined by the Charter are: 'the advancement and dissemination of learning and knowledge by teaching and research by a diversity of means, such as broadcasting and technological devices appropriate to higher education, by correspondence tuition, residential courses and seminars and in other relevant ways; and to provide education of university and professional standards for its students and promote the educational well-being of the community generally'.

1.2 What was finally established as 'The Open University' was originally conceived as the 'University of the Air'. It was first spoken of by the Rt. Hon. Harold Wilson in a speech in Glasgow in 1963. Thereafter, the idea was first examined by a Parliamentary Committee convened by Miss Jennie Lee, then Minister of State for the Arts; this committee's report was published as a White Paper in 1966, recommending the establishment of a Planning Committee to examine the idea in detail. The then Secretary of State for Education and Science accordingly set up a Planning Committee: 'to work out a comprehensive plan for an Open University ... and to prepare a draft Charter and Statutes.'

1.3 The Planning Committee which was composed almost entirely of educationists, began its work in October 1967 under the chairmanship of Sir Peter Venables, at that time Vice-Chancellor of the University of Aston in Birmingham. It presented its report, recommending the establishment of the University, in January 1969, and the government of the day accepted its recommendations.

1.4 Steps were taken early in 1969 to recruit the academic and administrative staff of the University, a site was chosen in North Buckinghamshire and the first buildings were erected in time for the incoming staff to be accommodated by September 1969. The detailed planning of the first courses began in that same month, in preparation for enrolling the first students in January 1971. Full details of the first courses and methods of applying are given in the University's first prospectus, copies of which have been made available. In the remainder of this paper, an attempt is made briefly to highlight the main elements of the teaching system.

2. Educational Provision

2.1 The Planning Committee had suggested that the Open University should make provision in three main areas of undergraduate studies, post-experience training and education, and in research for higher degrees - all for adults in employment who would thus be given the opportunity of continuing education for formal qualifications at university level, studying in their own spare time. The newly-established governing bodies of the University confirmed these objectives and decided that the first priority should be in the provision of courses leading to the first degree of Bachelor of Arts. Initial recruitment of staff was in the four main academic areas of Arts, Social Sciences, Science and Mathematics, each of which would create a Foundation Course to be available in January 1971; plans were also laid to develop two additional faculties, Educational Studies and Technology. The former is intended to develop courses for the in-service training and further education of teachers and consequently has no Foundation Course. The latter will introduce a Foundation Course in 1972 and develop a full range of undergraduate, post-experience and postgraduate courses for people in industry.

2.2 The basic undergraduate provision is through a self-contained 36 week course, the successful completion of which leads to the award of a 'credit'. A student must earn 6 credits, i.e. complete 6 courses successfully to earn the award of the basic degree of Bachelor of Arts. Two of his courses must be at Foundation level and the remaining 4 at second or higher level. For the award of the degree of B.A. with Honours, the student must succeed in a further 2 courses, making a total of 8, and these two must be at third or fourth level (roughly equivalent to third or fourth-year courses at universities teaching full-time residential students). The system is designed to enable a student to choose widely from different faculties, with a minimum of restrictions, or to take most of his courses in one faculty. Whichever he chooses he gains the same degree of B.A. It is expected that a 'quick' student will graduate with the basic degree in three or four years, the 'slow' taking five or six years. The system also allows students to have intervals of any length between their studies - women in particular are likely to find this useful on the arrival of a new baby!

2.3 Alongside the development of undergraduate courses, it is hoped to introduce from 1972/73 a programme of postgraduate studies leading to the three higher degrees of B.Phil., M.Phil., and Ph.D., and to develop a range of shorter, post-experience courses for people in industry, the public service and the professions. The postgraduate and the post-experience programme will fulfil three basic needs: of those wanting to proceed directly from a first degree to a higher degree who may often in the process be re-orientated from one discipline to another; of those who having practised one profession for some years, are called upon to make a significant change in their activities, such as from the scientific into the management side of industry; and of these who need 'updating' or 'refresher' courses in order to keep up with recent advances in their own field of work, whether scientific, technological or managerial.

2.4 The main teaching media available to the central body of course designers were broadcasting, both radio and television, and correspondence material involving not only the printed word but also a whole range of diagrammatic and pictorial presentation techniques. However, the whole conception of teaching at a distance, at university level, through an integrated multi-media system exploiting broadcasting over public channels in support of carefully designed correspondence course material was, certainly in the United Kingdom, a novel one and presented a host of problems. Not least of these was how to harness the highly developed professional skills of the educational broadcasters in the B.B.C. to the academic skills of university teachers, almost none of whom had relevant experience since they were selected for their academic standing and reputation largely from other universities and not for their experience in broadcasting. They have, in fruitful partnership with the B.B.C., been learning 'on the job' and the instructional system they are evolving is described more fully in section 3 of this paper.

2.5 The other elements of the instructional system, namely, the supporting services intended to provide the student in his own locality with study centre/viewing facilities, and a tutorial and counselling system are referred to in greater detail in section 3. They must be seen as an integral part of the total system, not as mere regional or local embellishments.

3. The Instructional System

3.1 The Open University's first intake of 25,000 students will start learning next January, through a unique instructional system. It will be unique in two ways: first, it will offer the student a unique combination of learning resources. Secondly it incorporates a comprehensive feedback network not to be found anywhere else in higher education. A computerised data bank will analyse information from students, tutors and counsellors for the benefit of course writing teams and researchers seeking to improve the system.

3.2 In considering the combination of learning resources in the system, we should state first who our students will be, since the resources have been chosen to match the learners. The Open University is enrolling people who are generally over 21 and working full-time. They do not necessarily have good secondary school qualifications. All of them wish to take a university degree because they did not have the opportunities before or could not take full advantage of them. Ideally, we should know far more about our learners, but we shall have to collect data first, at part of the feedback network.

3.3 The learning resources themselves take a number of different forms. First, and most important, the Open University student will receive regularly correspondence packages containing basic course materials. Each package will probably contain four weeks' work, separated into four units. There will be thirty-six units of study in the year for each course. A student may take one or two courses a year. A typical unit contains a considerable amount of printed exposition, illustrated by diagrams or pictures where necessary. To assist the student in assimilating the content, there are self-assessment exercises in which the student works out the answers to questions and then checks whether he is right by turning to a page on which the answers are shown. There are also unit tests or assignments, which are completed by the students and then sent to the Open University. Some of the assignments go to be machine-marked by a document reader linked to the computer. Others go to correspondence tutors to be marked and commented upon before they are returned to the students. Some units will include special materials such as glossaries. Others will direct students to special supplementary pages containing remedial or enrichment material. Also contained in the packages may be notes about the television and radio programmes.

The second learning resource available to the student is a part-time class tutor. It is planned that there will be several kinds of class tutors, not including the correspondence tutor already mentioned. The correspondence tutor will not only score the tests of assignments: he will also advise the student on further learning required. But if the student wishes to receive face-to-face assistance he will go to a study centre where he will be able to meet the class tutor. The work of the class tutors will be co-ordinated by staff tutors, who will be full-time members of the Open University staff.

The study centres represent another learning resource and will be located in about 250 communities. Besides being staffed by the class tutors there will also be places where students may meet counsellors, whose task it is to deal with any general problems students have in learning from the Open University's instructional system. For instance, if a student falls far behind, the counsellor will be there to advise him on whether to omit work in order to catch up. In the study centres there will also be television and VHF radio sets. In many study centres there will be additional facilities such as tape recorders, projectors, a library of the broadcast material in recorded form, and computer terminals for mathematics students.

The fourth learning resource available to students is the summer school. Each student will be expected to attend a summer school for one week in each foundation course. In these schools he will not only receive additional face-to-face assistance but will also engage in activities important for university level courses and impossible to arrange in the study centres. Laboratory work will feature prominently in the science summer schools for example. The summer schools are to be held in conventional universities and will fall in the middle of the Open University academic year which lasts ten months, beginning in January.

Broadcasting has an important qualitative role in the Open University instructional system. Each unit of each course next year will be accompanied by a 25 minute telecast (uninterrupted by advertisements). The question of how the television broadcasts are integrated with the correspondence materials is dealt with under 3.5 but it is worth noting that the telecasts in all courses will probably provide valuable motivation to independent learners who are cut off in many ways from the Open University itself. Similarly, each unit will be accompanied by a 20 or 25 minute radio broadcast.

These learning resources are being developed by course teams. Four have been operating since September, 1969, and about 20 new ones began work recently or will very soon. The course teams are unusual combinations of experts. Each is headed by a 'chairman' with strong leadership powers, including that of veto. Each discipline included in the course is represented by academics, up to a total of about 15. These are the physicists, historians, psychologists, mathematicians and so on. On each course team there is also an instructional systems expert from the Institute of Educational Technology. He is a 'software' development man rather than being concerned with instructional 'hardware', which is the responsibility of a special adviser to the university. From the B.B.C. there are producers of both television and radio programmes; they have vital roles to play, as we shall see. Attached to each team is a course co-ordinator, whose task it is to act as a link with service groups in the university such as the Publishing Office, with its editors and copyright clearers, or Media Development, with its graphics-designers and so on.

3.4 The development of the course materials involves several cycles of testing and revision. The complete development schedule is too complex to describe but these are the main phases:

First there is detailed consideration of the available resources and constraints, before the broad areas of the course are outlined. Next, the course team has to agree on the subject matter; this is no easy task. Once authors start work on their units, the course really begins to take shape. The BBC personnel start on television and radio programme outlines, for example, in collaboration with the authors. The first outlines of the correspondence material, the television programmes and the radio programmes are discussed by working groups within each course team before being submitted to the course teams as a whole. There is usually considerable debate about the integration of different disciplines within one course, and the relationship of a course with subsequent courses.

The course unit author is now ready to write his first full draft of the correspondence unit. The correspondence unit itself forms the core of the development activities as well as of the students' learning resources. The question of copyright clearance has to be attended to as well.

The correspondence materials plus the assessment items for each unit are then reproduced for developmental testing. They are sent to a group of applicants to the Open University who have agreed to collaborate in the trying out of the material. The data from the try out are analysed by the educational technologists, who are responsible for the developmental testing, and the results are reported to the course teams. Sometimes quite drastic changes are made on the basis of the learners' difficulties. The revised draft of the correspondence material is then ready to go to external assessors, whose task it is to comment on the accuracy of the subject matter. The external assessors are, naturally, experts in other universities in the area covered by the course units they assess.

Meanwhile, the work for the television programmes has been proceeding. A detailed script has probably been prepared and the programme notes for the student considered. Searches for illustrative material will have gone on, and shooting of film will have occurred where necessary. Rehearsal and final production is scheduled to occur after the correspondence package is completed, although in some cases there has been considerable interaction between the television programme and the course unit author, leading to changes in the course unit as a result of the television programme content. Similarly, work will have been going on towards the production of a radio programme.

The final stages of the course unit after it has been approved formally by the course team involve editing and printing.

3.5 This description of the production processes does not give much impression of what kinds of integration occur between the printed matter and the broadcasts, nor between these two and the tutorial system. In some subject areas, such as science, the programmes prepared for television will probably be vital to the understanding of the course. Students outside the BBC-2 area who have not seen the telecasts may have considerable difficulty in reaching the required standard for a credit in science, if no special provision were made for them. In fact, film and audiotape replay facilities will be provided through the study centres.

The integration of the science correspondence materials with the television programmes is quite close. In some programmes, students are being asked to turn to a particular page in the course unit, and then to enter in their course materials instrument readings and answers of various kinds. The course materials, in other words, will deliberately have gaps to be filled in from the telecasts.

Criteria have been established for selecting items for television in the science course. The first is that items requiring demonstrations of visual movement should go on television. The second is that the laboratory experience that conventional students have should be brought to the Open University student wherever possible on television. The third is that television should take the student into situations that he would not normally be able to go into, but which illustrate vital points in the course. An example of this last criterion in action will be the filming of operations inside a nuclear accelerator. In mathematics, the telecasts will include computer simulations of mathematical functions, using a technique only recently developed. In some other courses, the telecasts may provide more in the way of enrichment rather than essential instruction. They will deepen understanding.

3.6 The uses of the radio broadcasts will vary from course to course, as with the telecasts, but a very important role to be played by radio is the remedial one. Television material will need extensive production facilities and will be prepared far in advance of the date of broadcast. Radio can be used at much shorter notice to provide remedial advice after some, at least, of the assignments have been assessed. Radio is also the natural medium for the music which will be included in the Humanities foundation course and will be used for the broadcasting of some plays and readings from literature.

3.7 To put the broadcasts in perspective, however, it should be noted that in terms of the average student's time per week television occupies a small portion only (5%). Out of ten hours learning a week, the student will watch television for only about 25 minutes. Radio will occupy a similar portion of his time. Most of the remaining nine hours will go to reading and writing, including the answering of tests. The influence of television and radio, however, should not be underestimated, in spite of this small percentage. Television will probably provide the most powerful stimuli of all the learning resources.

3.8 It seems clear that the Open University cannot develop a perfect model of such a complex instructional system during its first year or for its first courses. Our first courses must be thought of as first approximations. The experience gained in developing these courses will no doubt influence the second-level courses a good deal, but the Open University is setting up a comprehensive feedback network that will enable the University to use the students' experiences to modify its system. The aim must be to establish a self-improving system. The Open University expects to have at its disposal the evaluative data necessary to judge the effectiveness of the Open University. It is both an innovative institution and a national one. Whatever lessons can be learned from the Open University's operations can certainly be transferred to many other parts of the world where thoughts are turning towards the establishment of similar national institutions. The Open University will act as a model.

3.9 The instructional system as a whole is of key interest to the University's Institute of Educational Technology. Its main functions and its complementary interests in institutional research and the evaluation not only of the effectiveness of the learning materials but of the overall impact of the University are described in Appendix A of this paper.

4. Relevance for other countries

4.1 From the time the University was established, a steady stream of international visitors - educationists, educational administrators, politicians, broadcasters - have visited the University to learn more about the system and the nature and scope of the learning materials being produced. These have included people from highly developed countries with sophisticated educational systems as well as from rapidly developing countries with urgent needs to accelerate the pace of higher general and technological education.

4.2 All have recognised the potential benefits of a system which

(a) can bring high quality learning material to the individual in his own home or simple local study centre (whether this be the village hall, a local school or a collection of rooms in an existing technical college;)

(b) is able to avoid the very high capital costs associated with establishing a conventional residential university; (the Open University's total capital development programme in the first five years will not exceed £6 million for a very large number of students, compared with about £15 to £20 million for a modern conventional university dealing with about 5,000 students only)

(c) can deploy a relatively small body of academic staff to provide courses for very large numbers of students. (Staff in all six Open University faculties will total about 140 plus some 30 senior staff in educational technology. The central operating budget, including payments to the BBC will be less than £5 million by 1973. The costs associated with providing regional tutorial, counselling and study centre facilities for over 40,000 students in that year will be less than £3 million.)

(d) can provide an ongoing system of 'continuing education' for the adult working population which at the same time will pay its rates and taxes and continue to contribute to the gross national product

(e) will provide as an additional educational resource a whole range of carefully devised and evaluated learning materials which can be made available to other parts of the higher and further educational system at very reasonable costs

(f) can surmount geographical and distance problems.

4.3 Broadcasting is an integral part of the Open University system, and this will provide the additional benefit of stimulating large sections of the general public. Broadcasting is not, however, a sine qua non of an operation of this kind. A number of techniques of providing visual material in recorded form are in an advanced stage of development and it is not too optimistic to expect that within the next five years, some very economic systems will be generally available.

5. Marketing of Open University Materials

5.1 With all those factors in mind, the University intends to market its educational materials to other institutions in the United Kingdom, if they wish to use them, and to lease their use by overseas governments, institutions, and broadcasting agencies. Steps are currently being taken to establish a marketing division to co-ordinate these activities.

5.2 It is envisaged that sales or leases could take the form of

(a) licencing the use of a whole course, comprising the radio programmes, television broadcasts and printed correspondence material including perhaps remedial packages. The Foundation Courses in Mathematics and in Science may, for example, have key importance in any crash educational programmes in developing countries, whose human resources for teaching these subjects may be very slender.

(b) sales of the printed materials as new kinds of text book in their own right. These may require a considerable amount of editing since the correspondence materials as presently devised contain references to the broadcast elements of the courses.

(c) the marketing of the printed units of correspondence material to people inspired by the broadcasts to ask for them.

(d) the provision not only of course materials but also of a consultancy service on the development of analogous systems utilising the teaching techniques and integrated methods of the Open University, adapted to the circumstances of the receiving country. This is a longer-term potential which will require more resources than the Open University at present commands, but the matter will be explored with a view perhaps initially to launching one or two pilot projects. In experiments of this kind, the Open University will not be able to act alone and will therefore need to examine whether other major national or international agencies are interested in being associated with and supporting the University in this.

5.3 Activities of this kind make it essential for the Open University to have a high degree of freedom in the exploitation of its system and materials. To this end, the whole question of Rights and Copyright, both in the broadcast elements and in the printed materials has been carefully examined, and the contracts being made will in most cases give the University the right to lease the external use of the material subject to the payment of additional fees.

6. The Admissions System and Enrolments for 1971

6.1 One firm principle of the Open University's system is that no formal educational requirements are required for admission. The University therefore devised a selection procedure operated by a computer whereby selection was made primarily on the basis of those applying first having the greatest chance of earning a place as a student. Three constraints were, however, introduced to ensure that

(a) some regard was given to the geographical distribution of applicants in order to spread the number of students admitted fairly over the United Kingdom as a whole;

(b) no one occupational group should swamp the admissions because of its numerical superiority in the applications list. Thus a quota for teachers was set a little lower than their proportion of the applicants.

(c) admissions were reasonably well balanced between the four Foundation Courses on offer.

6.2 In originally devising its admissions procedures, the University made provision for injecting two additional constraints on the computer selection: by weighting for age considerations, and also for 'suitability' of individual candidates, as measured by a judgement of applicants' general readiness to cope with work at university level. This judgement was made on examination of the applicant's particulars as set out in the University's application form, and in some instances after arrangements had been made to interview individuals. In the event, only a small proportion of applicants were deemed to be generally unsuitable; and their age distribution was such that this was not considered a serious factor. Consequently, neither of these constraints were used in the selection process.

6.3 Some detailed information about applications in the first year of operation and about the outcome of the selection of the 25,000 students who will begin their studies in January 1971 may be of general interest. The University received 42,821 applications in the period of enrolment beginning 15 January 1970 and ending 4 August 1970. After subtracting those who subsequently changed their minds and withdrew their applications, the nett figure remaining from which 25,000 students had to be selected was 40,817 individuals. Many of these applied to do two courses in the first year rather than one and the total course applications were 62,147.

6.4 Tables 1, 2 & 3 attached show, respectively, the analysis of applicants by region, their distribution by broad occupational category, and their selection of courses; and indicate the target quotas set for the selection procedure. The whole exercise, as has been said, was designed to achieve as fair a distribution between geographical regions, occupational categories and the four foundation courses as could be devised, having regard to the overall profile of applications and the date on which applications were made.

6.5 Obvious points of interest are:

(a) the very high number of teachers who applied. They knew most about the Open University, which had been a matter of educational and political debate for some time; had much to gain by acquiring a degree qualification since their salary prospects under present arrangements in the U.K. would be immediately enhanced.

(b) Only 4.5 of the applicants already have a degree qualification.

(c) A fairly high proportion (14.7%) are from the ranks of partially qualified scientists, engineers, laboratory assistants and technicians who wish to get a degree qualification.

(d) The proportion of 'working class' candidates is low. This is no doubt partly due to the fact that information about the University and the new opportunities it presents will take some time to reach these occupational groups; and they also will need a certain amount of persuading to take the new opportunity. The University's information services are aware of this problem and steps are being taken to disseminate information through industrial and commercial firms.

One interesting point not known in the tables is the distribution between sexes: 70% males, 30% females.

6.6 One year's statistics is no basis for a rational judgement about the nature of the impact on society of the Open University. It will be interesting to see to what extent the broadcasting of the University's courses in 1971 will affect the nature of the applications.

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OPEN UNIVERSITY ADMISSIONS: 1971

TABLE I

REGIONAL ANALYSIS

	APPLICANTS				ALLOCATION OF PLACES (PROVISIONALLY) AND SUBJECT TO FURTHER MODIFICATIONS	
Region	Number	Percentage of total	Estimate of Percentage of Population in Region	Quota set after scrutiny of applications	Percencage allocated places	Absolute number allocated places
London	7571	18.5	17.9%	18.2	18.0	4503
South	4621	11.3	8.9%	10.1	11.3	2813
South West	2332	5.7	6.1%	5.9	5.6	1411
West Midlands	3452	8.5	9.2%	8.9	9.0	2238
East Midlands	2699	6.6	7.0%	6.8	7.1	1765
East Anglia	3497	8.6	7.8%	8.4	9.1	2282
Yorkshire	3112	7.6	8.5%	8.0	7.8	1957
North West	4337	10.6	12.1%	11.3	11.5	2873
Northern	2080	5.1	5.5%	5.3	5.4	1356
Wales	1801	4.4	4.9%	4.6	3.6	892
Scotland	3787	9.3	9.4%	9.3	9.0	2262
Northern Ireland	1528	3.7	2.7%	3.2	2.6	648
	40817	99.9	100.0%	100.0	100.0	25000

OCCUPATIONAL ANALYSIS

(Numbers given refer to non-graduates, those in brackets refer to graduates)

APPLICANTS

	Occupational Group	Number	Percentage of total	Quota set after scrutiny of applicants	Percentage allocated places	Quota percentages as absolute numbers	
1.	Housewives	3,758	8.9 (0.3)	10.0% (0.1%)	9.6 (0.2)	2,500	(25)
2.	Armed Forces	699	1.7	2.0% (0.1%)	2.0	500	(26)
3.	Administrators and Managers	2,830	6.6 (0.3)	4.5% (0.1%)	5.4 (0.2)	1,125	(25)
4.	Teachers	14,642	33.6 (2.3)	30.0% (1.0%)	33.0 (1.3)	7,500	(250)
5.	Professions and the Arts	4,869	11.3 (0.6)	8.5% (0.1%)	9.7 (0.3)	2,125	(25)
6.	Qualified Scientists and Engineers	3,275	7.3 (0.7)	8.0% (0.1%)	9.0 (0.3)	2,000	(25)
7.	Draughtsmen, Laboratory Assistants and Technicians	3,037	7.4 (0.1)	9.0% (0.1%)	9.1 (0.1)	2,250	(25)
8.	Electrical, electronic, metal and machines and allied trades	730	1.8	3.0% (0.0%)	2.3	750	(0)
9.	Other manufacturing, farming, mining, construction, transport and communications	1,171	2.8	5.0% (0.1%)	3.1	1,250	(25)
10.	Clerical and office staff	3,324	8.1 (0.1)	10.0% (0.1%)	8.0 (0.1)	2,500	(25)
11.	Shopkeepers, sales, services and sport, recreation workers, Fire Brigade and Police	1,409	3.4	4.5% (0.1%)	3.7	1,125	(25)
12.	Not working (other than housewives) retired, independent means	1,040	2.4 (0.1)	3.0% (0.1%)	2.4 (0.1)	750	(25)
13.	In institutions	33	0.1	0.5% (0.0%)	0.1	125	(0)
		40,817	95.4 (4.5)	98.0% (2.0%)	97.4 (2.6)	24,500	(500)

COURSE ANALYSIS

20,000 students will take one Foundation Course each and 5,000 will take two, giving a total of 30,000 courses studied during the first year.

The analysis of applications for courses received and the recommended quotas are:

Course	Number	% of Total	Target Quotas
Mathematics	12,039	19.4	7,000
Science	11,605	18.7	7,000
Arts	16,939	27.3	8,000
Social Sciences	21,564	34.7	8,000
	62,147		30,000

APPENDIX A

EDUCATIONAL TECHNOLOGY AT THE OPEN UNIVERSITY

Introduction

Technology, to most people, involves machines. But more correctly technology involves men, machines and materials. In educational technology, machines have received undue attention in some countries, and too little effort has been expended on examining the men and materials in the instructional systems incorporating those machines. Machines, whether they are television networks, computers or tape-recorders, must fit into the system as a whole.

Educational Technology at the Open University has adopted the 'systems approach'. That is to say the educational technologists are attempting to develop an instructional system in which all three, men, machines and materials, have their proper places. In this system there must be careful analysis of each of these three components as they are synthesized into an integrated whole.

The Institute of Educational Technology

Within the Open University, an Institute of Educational Technology has been established, occupying a central position between the six Faculties (Arts, Educational Studies, Mathematics, Science, Social Science and Technology) and the service units of the University (the Secretariat, the Media Division, the Library, and the Regional Academic Services). Outside the University, the BBC occupies an important position, of course, providing production and broadcast facilities for television and radio.

Course Development Functions of the Institute

Within the faculties, teams are developing the correspondence core and other elements of each course. Educational technologists from the Institute are active members of each of these teams. They are undertaking three critical course development functions: first, they are advising on the design and structure of courses; second, they are writing tests for use with the courses; third, they are arranging and conducting trials of course components.

The writing of appropriate test questions for the courses important because the student's answers to the questions will provide much information on how well the course has taught. At this early stage of course development, however, the questions are also important because the process of writing them demands careful analysis of course material. This analysis is being undertaken, in most cases, through a dialogue between the educational technologists and the writers of the course material. The dialogue results in improved questions and improved course material. Objectives and exposition are clarified.

Trials of course components are invaluable in the context of the Open University's first years. Little is known about the learners entering the system. Initial drafts of correspondence material, and tapes of television and radio broadcasts need to be tried out on a variety of adults, preferably ones likely to become Open University students. The items prepared by the University's staff on the basis of experience and intuition are put to the test. The empirical data gathered from the trials are powerful persuaders, and in some cases extensive revisions are made.

Besides performing these two critical course development functions - preparing test questions and conducting trials - the Institute staff are also engaged in putting together a guide for Open University students. The Open University is so different from anything the students will have been in before that special instructions will be provided about how to study in the University's multi-media system. General advice will also be offered on study habits, reading skills, and so on. The first edition will have to be tentative, however, as the exact problems the students will meet and the solutions some of them will discover are not yet known.

Course Research Functions of the Institute

If future course development is to be satisfactory, there must be far more data available than the trials provide. Each trial involves only a few learners (up to 50, but usually only about 25) working under different conditions from the 'real' students who will take the courses in 1971 and later. Plans are being laid to conduct a major and comprehensive evaluative research programme at the Open University, but in the meantime data are being collated from a small research project involving adults taking courses similar to those of the Open University but at a lower level. The National Extension College at Cambridge is offering courses by correspondence that are supplemented by BBC TV programmes. The students taking these courses are being assessed by the Open University in various ways. In particular, their reactions to the different components of the courses are being measured through questionnaires. Their problems in studying and their general background is being examined too. Information from this project should be available soon to the Open University course writers, who should find the data helpful. The NEC/BBC courses are intended to help adults to get back into the world of learning, possibly at the Open University.

Future Course Research

The major evaluative research programme that should be undertaken if the Open University is to have a self-correcting and self-improving instructional system is not yet in operation.

As a basis for the extensive course research proposed, a computerized data bank will be set up. Several major studies will be based upon the data bank. One main study will be mainly a series of diagnostic analyses. Another will include longitudinal surveys of students before and after graduation. A third will be an evaluation of the tuition and counselling components of the system.

Computerized Data Bank

Data will be collected for the data bank chiefly from the students themselves. Other data sources will be University staff including tutors, counsellors, and others, and employers. Collecting the data has already begun at the Open University; for each student a file is being established on computer tape. Later, students will be asked to complete mailed questionnaires. The data from these questionnaires will be stored on a direct access computerized system which will permit retrieval of information in many forms. Computer programmes are being developed to conduct analyses to suit the needs of the University.

Diagnostic Analysis

The modification of course material must be done with the characteristics of men (the learners) and machines (the media) more accurately borne in mind than can be done at present. There must be less dependence upon intuition, although leaps of intuition will still be required. The diagnostic analyses should give evidence of the effectiveness of different course segments, and, possibly, of the effectiveness of different media. Similarly, it should be possible to compare the success of differing groups of students, and the effectiveness of tutors. The chief aim of all these analyses is to assist in further course development.

The University is particularly concerned about the drop-out problem. The experience of many other institutions that have used one or more of the components that are in the Open University instructional system shows that a high drop-out rate must be expected among students studying at a distance. Yet the cost effectiveness of the system is improved greatly if the drop-out rate can be reduced. As in most preventive systems, the earlier the potential drop-out can be identified, the better. Diagnostic analyses should assist in this identification.

Longtitudinal Surveys

In the second major study, the men involved in the system at the learning end, are to be the subject of detailed study over several years. The impact of the Open University upon its students, before and after graduation, is to be assessed. The career patterns of the students will be of particular interest. The students' employers will be questioned too.

In the same study there will be an examination of changes in the use of leisure, and in particular of the use of mass media. It seems likely that the demand made by the Open University upon students' free time will have some remarkable effects. The large numbers of students involved will provide an unparalleled opportunity for study of these effects.

Tuition and Counselling

The Open University will be providing university education for a very wide range of students, some of whom will need greatly the support of face-to-face tuition and counselling. Very little is known, however, about the kinds of support that will be required. The exact roles of the tutors and counsellors must be defined, and their effectiveness evaluated, particularly as they comprise a relatively costly part of the system.

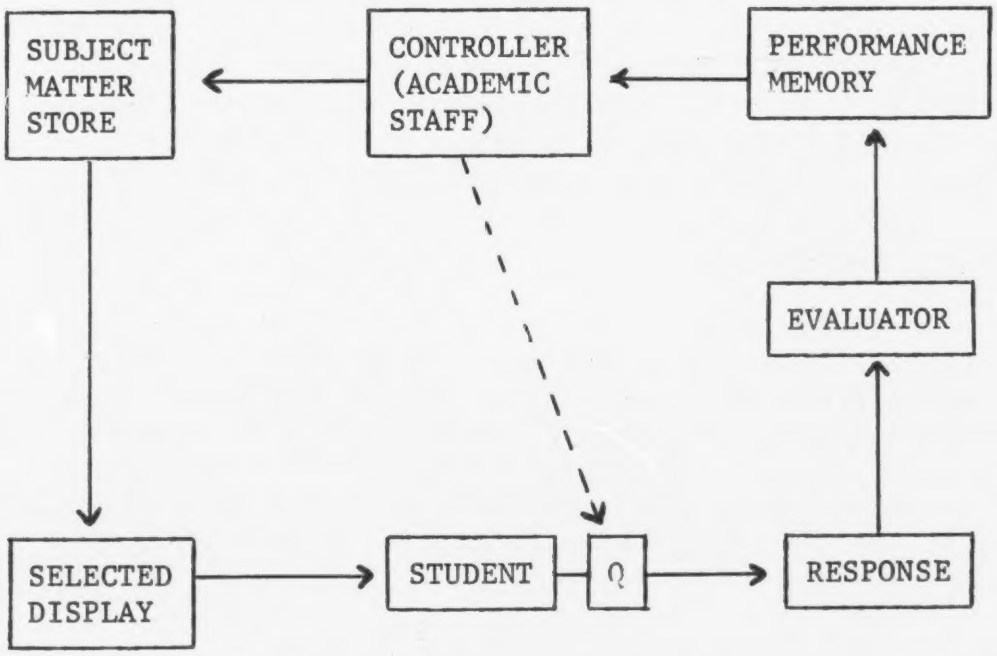
The Open University as an Instructional System

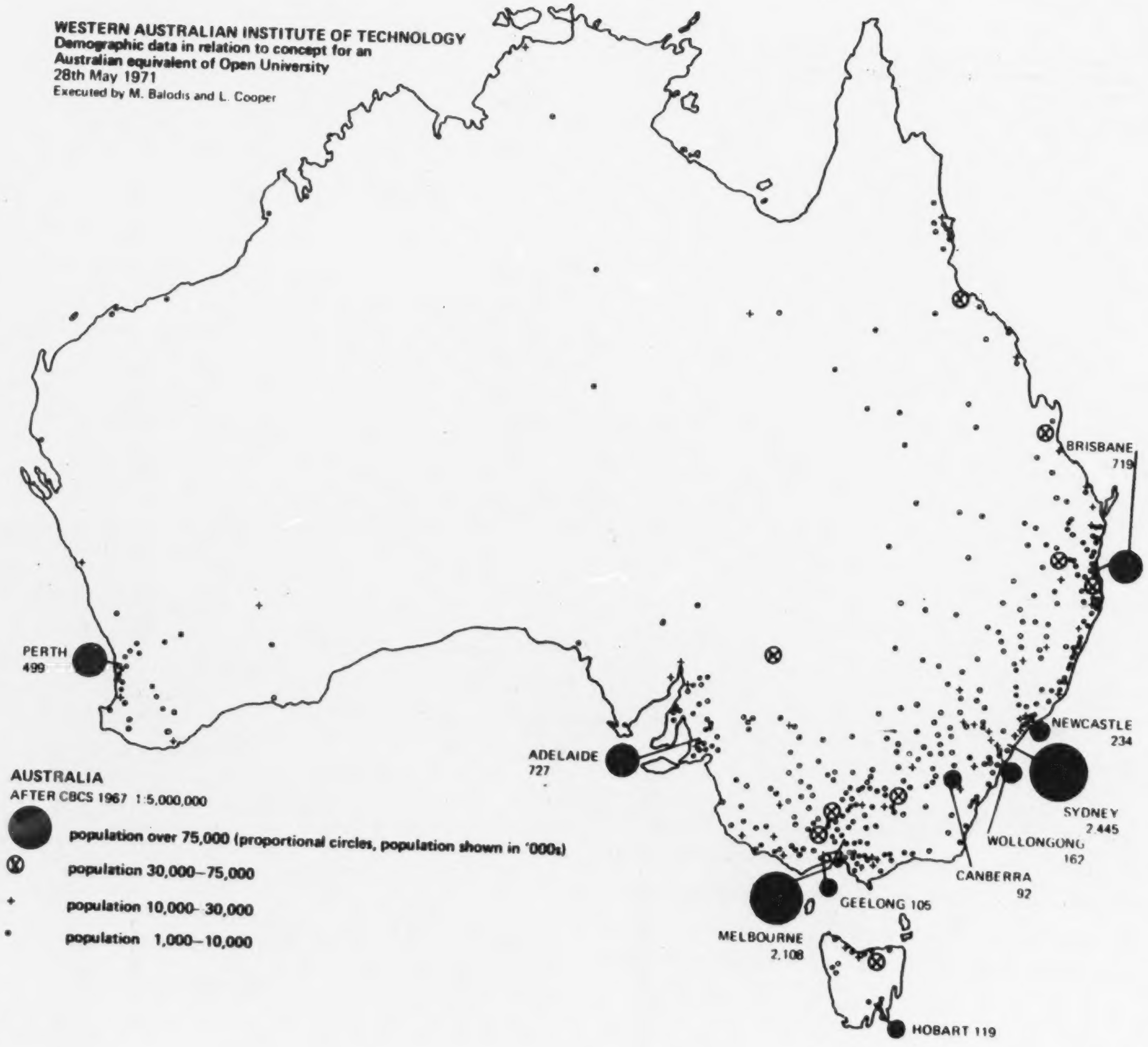
There are two premises upon which the Open University is being developed as an instructional system. The first is that there should be cycles of development and testing through which are put as many components as possible. Thus the develop-test-develop cycle is found in many areas of the Open University's functioning. Although it is to be found too in conventional universities, in the Open University there is a much more conscious attempt to put the cycle into action. The second premise is that the Open University will operate as a 'closed loop' total instructional system (see diagram). The controllers of the university are the academic staff. This is true of all British universities. They have between them a subject matter store from which they select displays. The selected displays comprise a chosen scope and sequence of subject matter to be presented through selected media. The student receives the selected displays and is subsequently questioned on his acquisition of knowledge from the subject matter store through the displays. His responses are fed into an evaluator which determines whether they are correct or incorrect. The evaluator may consist of a computer scoring mark-sense cards, or a correspondence tutor assessing assignments. The performance of the student is placed in some form of performance memory, probably the computerized data bank, and is notified to the academic staff. The academic staff may then choose to make a new selected display from the subject matter store in order to correct the students' incorrect acquisitions from the first selected displays. Naturally the tutors have a major role to play in this latter process.

The Open University will operate on the basis of information retrieved from the students, and will endeavour to modify its courses on the basis of this feedback.

The analysis and synthesis of the sub-systems necessary to produce this instructional system for the Open University are among the functions of the Institute of Educational Technology."

The Open University as an Instructional System





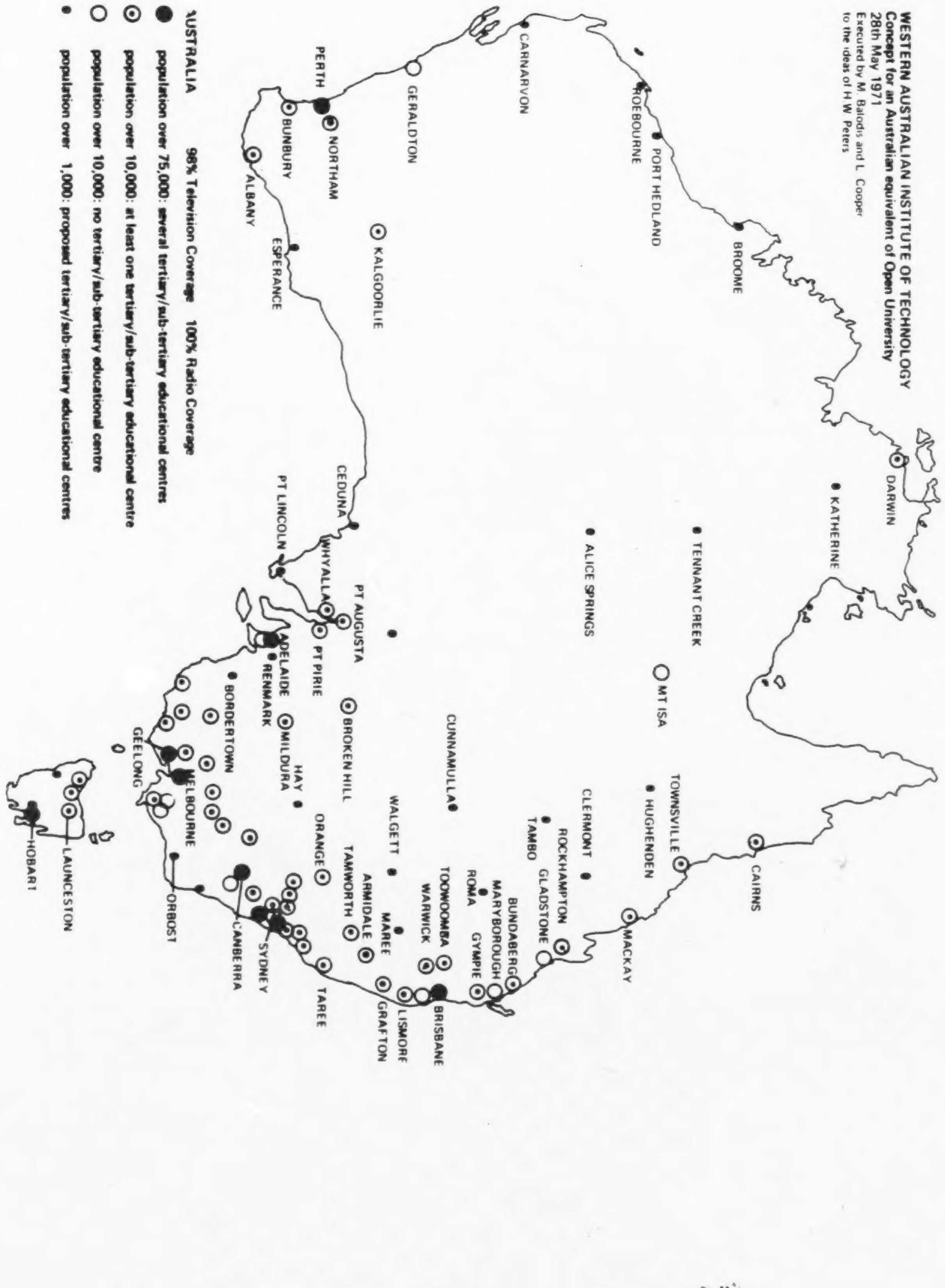
WESTERN AUSTRALIAN INSTITUTE OF TECHNOLOGY
Demographic data in relation to concept for an
Australian equivalent of Open University
28th May 1971
Executed by M. Balodis and L. Cooper

AUSTRALIA
AFTER CBCS 1967 1:5,000,000

- ● population over 75,000 (proportional circles, population shown in '000s)
- ⊗ population 30,000–75,000
- + population 10,000–30,000
- • population 1,000–10,000

PERTH
499
ADELAIDE
727
BRISBANE
719
NEWCASTLE
234
SYDNEY
2,445
WOLLONGONG
162
CANBERRA
92
GEELONG 105
MELBOURNE
2,108
HOBART 119

ANNEXURE 4/II



WESTERN AUSTRALIAN INSTITUTE OF TECHNOLOGY
Concept for an Australian equivalent of Open University
28th May 1971
Executed by M. Balodis and L. Cooper
to the ideas of H W Peters

AUSTRALIA 96% Television Coverage 100% Radio Coverage

- ● population over 75,000: several tertiary/sub-tertiary educational centres
- ⊙ population over 10,000: at least one tertiary/sub-tertiary educational centre
- ○ population over 10,000: no tertiary/sub-tertiary educational centre
- • population over 1,000: proposed tertiary/sub-tertiary educational centres

CARNARVON
ROEBOURNE
PORT HEDLAND
BROOME
DARWIN
KATHERINE
GERALDTON
PERTH
NORTHAM
BUNBURY
ALBANY
ESPERANCE
KALGOORLIE
TENNANT CREEK
ALICE SPRINGS
CEDUNA
PT LINCOLN
WHYALLA
PT AUGUSTA
PT PIRIE
ADELAIDE
RENMARK
BORDERTOWN
MILDURA
BROKEN HILL
MT ISA
CUNNAMULLA
HAY
GEELONG
MELBOURNE
ORBOST
HOBART
LAUNCESTON
CANBERRA
SYDNEY
ORANGE
WALGETT
TAMWORTH
ARMIDALE
MAREE
TAREE
GRAFTON
LISMORE
BRISBANE
TOOWOOMBA
WARWICK
ROMA
GYMPIE
MARYBOROUGH
BUNDABERG
GLADSTONE
TAMBO
ROCKHAMPTON
CLERMONT
HUGHENDEN
TOWNSVILLE
MACKAY
CAIRNS

CHAPTER 5

GENERAL TOPICS: SUMMARY AND RECOMMENDATIONS

5.1 NATIONAL POLICY ON HIGHER EDUCATION

It is recommended that the responsible Commonwealth and State Ministers, in consultation with their advisory bodies, consider a more explicit national policy on such facets of education as the roles of universities and Colleges of Advanced Education, teacher education and resource allocation and control.

Various approaches can be made including consultation between appropriate bodies and subsequent joint policy declarations: a series of national conferences attended by overseas experts, selected particularly for their visionary approaches. Such techniques would be helpful but the real point is that a national policy for the next decade or so is an urgent requirement not capable of achievement through an ad hoc system. There is a need for institutional decision-making within the context of a clearly enunciated and understood overall national policy determined by governments.

If it is decided to set up a Commission of Inquiry, its composition would need careful thought. Not only should the component elements and the states have representation but, more importantly, selection of membership should be guided by the need for people possessing vision, imagination and daring, rather than prestige, which is gained by long years of service.

5.2 EDUCATIONAL RESOURCES INFORMATION CENTRE SYSTEM

It is recommended[1] *that the Department of Education and Sciences negotiate with the Educational Resources Information Centre (ERIC) with a view to acquiring its data and system for Australia and that, if introduced, its range should not be restricted to academic research, but also to many of the administrative and physical problems which affect Australian higher education.*

Examples of the latter might well include the design and construction of buildings and cost analysis techniques. It could introduce the principle of inter-firm comparisons.

5.3 AUSTRALIAN PARTICIPATION IN INTERNATIONAL CONFERENCES

It is recommended that the Department of Education and Science give consideration to improving the methods by which decisions are made on the selection of persons to represent Australia at international conferences; the revision of methods to include wider dissemination of information on forthcoming conferences, and the seeking of nominations by relevant bodies.

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[1] In view of time urgency, related to the visit of an ERIC official to Australia, this recommendation was made some months ago to the Department of Education and Science.

The reasoning behind this recommendation is two-fold:

(a) considerable criticism was encountered from the organisers of some conferences, officials of which considered the representatives as not being appropriate and thus not being capable of full and constructive participation

(b) the wider dissemination of information can only assist in obtaining more of a representative panel, from which to select appropriate personnel. (The Western Australian Institute of Technology has not yet obtained notice of any such conference, let alone made a nomination and this may be true of all the Colleges of Advanced Education.)

5.4 ROLE OF CHIEF EXECUTIVE OFFICERS' COMMITTEE AND CO-OPERATION WITH VICE-CHANCELLORS' COMMITTEE

It is recommended that the Chief Executive Officers' Committee of the Colleges of Advanced Education and the Vice-Chancellors' Committee should make arrangements to set up channels of communication between the two bodies and that, furthermore, the Committees separately or in combination act as centres of information on such matters as staffing, salaries and conditions, policy on endowment procedures, counselling services, design and building construction, campus planning and the like.

Such complementary organisations should engage in dialogue together, in addition to the discussions which take place between the Commonwealth advisory committees, and some of the State advisory boards. National policies are not entirely determined by advisory bodies, nor indeed by governments; the senior men have a significant role in framing such policies and, instead of acting separately, they should work jointly at least in areas of mutual interest.

As to data collection and dissemination, each institution is spending an absurd amount of time and effort through ad hoc telephone, telex and written enquiries. A regular news sheet would be a valuable and economical communication channel.

If these types of activity were undertaken, a national basis of fees for the central body's services would require negotiation between the institutions involved.

5.5 ECONOMIC PLANNING IN EDUCATION

It is recommended that Commonwealth and State bodies in collaboration, and individually, investigate ways and means of relating higher education to economic planning.

Student choice is the Australian philosophy, whereas other nations are more concerned with labour market demands. It is unlikely that either system can claim to be immeasurably superior to the other. On the other hand, the virtual absence (at least to the awareness of the Colleges of Advanced Education) of a coherent national plan, relating to manpower requirements, can produce (and has produced) either socially disoriented surpluses of graduates or acute shortages of required highly-trained manpower. The problem has to be faced at a national and state level.

In the absence of any more significant attempts, the Western Australian Institute of Technology has begun in a minor key its own pilot surveys; in addition, the writer has undertaken a case study for UNESCO, one aspect of which involves the relationship between higher education and the economy.

5.6 ORGANISATION OF THE ACADEMIC YEAR

It is recommended that two semesters and a summer school is the most appropriate form of organisation of the academic year for Colleges of Advanced Education, and would achieve greater utilisation of resources, more flexibility in course design, some improvement in the average time taken to graduate, and a reduction in the wastage rate.

Annexure 5/I explains the reasons for this recommendation. It is a report of a Working Party, set up by the Western Australian Institute of Technology Academic Board, and endorsed by the latter in July 1971.

5.7 ACADEMIC PLAN FOR THE WESTERN AUSTRALIAN INSTITUTE OF TECHNOLOGY TO 1981

It is recommended that, as there is some evidence to suggest physical planning has had dominance over educational policy, the Council, through the Academic Board, authorise the production of the first comprehensive academic plan for the Institute phased to 1981; that such a plan be flexible and kept under revision; that major policies be reviewed in the light of such a plan; that it be concerned with such matters as the objectives of the Western Australian Institute of Technology, the teaching/learning process, curriculum development and revision, foreseen changes in professions, the use of new communication media and possible changes in the technologies and media associated with higher education.

I would see the first version of such a plan being available - after full and Institute-wide discussion - by April or May 1972, to enable decisions for the Third Triennium to be taken in the perspective of such a plan.

5.8 DESIGN AND CONSTRUCTION OF BUILDINGS FOR TEACHING

It is recommended that in the light of accumulating evidence of changes in teaching methods, technology, the professions and job-tasks, and the resultant early outmoding of existing building design ideas, the Commonwealth Advisory Committee on Advanced Education give consideration to a major research project. Such a project would involve Australian and overseas architects, engineers, designers and educationists. It would investigate in depth new approaches to the design and construction of buildings for teaching, with the objectives of achieving (a) greater flexibility in use (b) easier modification as and when technological change renders present buildings ineffective.

The above recommendation is self-explanatory, other than for the need to add that there is no more serious problem in higher education than (a) to reduce building costs and (b) to adopt a design philosophy more in line with the age in which we live. Institutions should be building for change not for perpetuity.

ANNEXURE 5/I

June 1971

PLAN FOR THE RE-ORGANISATION OF THE ACADEMIC YEAR

A report submitted to the Academic Board
by the Working Party established in 1968

The report which follows makes a series of recommendations for action by the Western Australian Institute of Technology based on material collected and interpreted by the members of the Working Party. A considerable amount of information has been obtained during the three years work: far too much for inclusion in a report such as this. However, interested members of staff are invited to refer to the material which is held in the Library, or to the file documents held in the Department of Administrative Studies, if they would like to pursue particular questions beyond the argument in this report.

In presenting our findings, the members of the Working Party acknowledge their debt to the many members of the Institute staff, and to the other Australian and overseas individuals who have freely contributed to our understanding of the working of academic calendars.

C.E. Carr (Chairman)

A.L.R. Camerer

L.M. Croy

J.R. deLaeter

A.J. Gilbert

M. Liveris

W.L.A. Munro

H.W. Peters

The Academic Board first considered a proposal to adopt a two semester/summer school calendar on April 18, 1968. Members of the Board agreed that some change from the traditional three-term system might well be desirable, but were sharply divided about the form which any change should take.

A Working Party was therefore constituted to consider the various alternative teaching calendars, the current practices of other Australian educational institutions, and the academic and administrative considerations involved. The Working Party has established links with the various relevant committees and units within the Institute, and with many Australian, and some overseas organisations. Several interim reports have been issued; and during 1969 the membership of the original Working Party was augmented to include Messrs. Peters and Croy in recognition of the important administrative and financial considerations involved in any proposed change in the calendar. During 1970, the teaching departments in the Institute undertook extensive studies of the effects of either semester or quarter calendars, and the results of this exercise have proved valuable in tracing the practicability of these two programmes.

As often happens, the world in which this report is prepared is markedly different from that in which the study was initiated. Within the Institute there has been widespread discussion of various teaching calendars; one department has adopted a semester arrangement; and several others have been gaining experience with semester and quarter units within the existing organisation of the academic year. The Australian Vice-Chancellors' Committee has commissioned a study of year-round teaching, and an interim report was published by Professor Cochrane in 1970. Also during this period several CAEs have announced semester calendars; and two Australian universities are operating on modified semester plans. Perhaps no greater change has occurred than in the ideas of the members of the Working Party, where exposure to a considerable amount of information has made us much more aware of the value of alternatives to the three-term scheme.

In preparing this report, we present first a set of recommendations, followed by the evidence which has led us to these opinions. The appendices include a tentative 1973 academic calendar, and a detailed definitive statement on the nature of each of the programmes which we have considered.

RECOMMENDATIONS

1. That the Institute adopt a semester calendar

2. That the semester programme be linked with the use of the summer period for course teaching and for continuing education

3. That the semester calendar be introduced in 1973

4. That Boards of Study be encouraged to adopt units complete within a semester, but that they are not compelled to convert all subjects to a semester basis if there are sound educational arguments for maintaining a particular subject on a 35-week pattern

5. That Boards of Study be recommended to convert existing subjects to a semester scheme by maintaining the existing contact hours and halving the content wherever possible; and by increasing contact time only when it is found to be impossible to make a viable unit in the other way

6. That immediate discussions be entered into with the Tertiary Education Commission, the Secondary Teachers' College, the high schools, and the Student Guild to publicise the proposal and to discover and eliminate problems which may be involved in it

7. That each semester should contain 17 teaching weeks and one week for terminal examinations; and that each semester should include a non-teaching week coincident with existing breaks in the school calendar in May and August/September (Appendix I shows the application of this recommendation to the 1973 calendar)

8. That negotiations be entered into with the Academic Staff Association and the Civil Service Association for the balancing of the two semesters by grouping the days now taken as public holidays to give either a longer break at Christmas/New Year or Easter.

THE PURPOSES OF THE INSTITUTE

A teaching calendar makes sense only in terms of a set of purposes. This is not the place for a definitive treatment of this complex topic, but enough must be said in order to justify the proposals which the Working Party has to offer.

The Institute exists as part of the provisions which society has made for the development of a literate and technologically sophisticated population able to create a widely satisfying way of life. Society has insufficient resources to be able to do all of the things it seeks, and the Institute shares with other social institutions the responsibility for seeking both effectiveness and efficiency in the use of resources entrusted to it. One of the factors affecting our contribution is the way our teaching calendar is arranged, for the calendar influences (but does not necessarily determine) the quality of the learning experiences gained by our students. The organisation of the academic year also affects the extent to which our human and physical resources are utilised, and hence the social return on the investment which the Institute represents. The teaching calendar also influences our relationships with the organisations from which our students are drawn, and the organisations in which their acquired skill and knowledge will be employed.

As the Institute was established to complement existing institutions such as the University and the Technical Education Division, it is important to remember that the way it arranges its academic year should facilitate its function of stressing teaching, and flexibility of educational opportunity. Any adopted programme should therefore emphasise the creation of effective teaching/learning situations, and facilitate the widest possible points of entry to and from the various fields of employment of our graduates. Any adopted programme should also ensure that adequate arrangements can be made for continuing education, both post-graduate and post-experience, in order that the resources of the Institute should be able to make their maximum contribution to our society.

These considerations have been kept in mind throughout the enquiries made by the Working Party. The recommendations offered are, we believe, capable of making a substantial increase in our ability to fulfil those purposes.

THE FOUR SYSTEMS IN COMMON USE

Three-Term System

The three-term system is widely used in Australia and in the United Kingdom and has been the system adopted throughout the spectrum of education in Western Australia. The three terms are usually of unequal length, with the teaching year commencing in February or early March, and ending late in October (in the case of most universities), November (most CAEs) or December (most schools). The colleges have teaching years of some 34+ weeks, while the universities' year is in the order of 26 weeks.

The main characteristics of the scheme are its familiarity and the relative ease with which it is possible to move students and staff from one institution to another because of the degree of standarisation of commencing dates.

Under this scheme the great majority of curricula cover the full teaching "year" although the number of hours of class contact per week varies widely. In recent years the scheme has, however, lent itself to the development of "half" units with terminal assessment after half of the teaching period.

Semester System

The typical teaching calendar in the United States comprises two semesters each of 17 weeks with, in many cases, a summer teaching programme in which both "credit" and non-credit teaching is offered.

In Australia, several tertiary institutions have recently adopted the semester plan, but not necessarily associated with a teaching summer session. As noted above, a number of semester-length subjects have appeared with three-term calendars, the Department of Art and Design at the W.A.I.T. being one example among many.

The usual practice with semester programmesis to regard each 17 week period as complete in itself, with enrolment occurring immediately prior to each teaching period. Subjects ("courses" in American terminology) are self-contained within each semester, and there is typically little sequencing of subjects, permitting the student considerable freedom of choice in the range of subjects taken and the order in which they are completed. It is important to realise that the full advantages of the semester plan cannot be achieved unless there is a deliberate move towards such freedom of choice and movement.

The two periods of 17 weeks, combined with the non-teaching break between semesters comes to approximately the same total of weeks as that involved in the three-term scheme with its term vacations; thus allowing the two schemes to be run together within a single educational system.

The Quarter Plan

This arrangement has received considerable attention in the United States during the past decade, and has been introduced in a significant number of institutions. The typical pattern is for a student to be enrolled for three quarters each of 11 weeks for an "ordinary" load, with the possibility of enrolling for a fourth quarter in the summer if he has had to repeat subjects or if he wishes to accelerate his progress.

Subjects are typically planned as self-contained units within a quarter and, as in the semester plan, there is considerable freedom of choice and of movement for the student. No examples of this scheme are known in Australia.

The Trimester Plan

Under this plan, introduced into a number of northern American universities in the last decade, there are three equal teaching periods in the year. Each period is of some 15 weeks duration so that the sequence of three virtually fills a calendar year. The plan is predicted on the assumption that it will be possible to take in a new group of students three times during the year, and that a very high degree of utilisation of facilities is essential.

No examples of this scheme are known in Australia, and several American universities which had adopted the scheme have rapidly become disenchanted with it.

EVALUATION OF THE FOUR SCHEMES

The Three-Term Plan

The familiar pattern has a considerable amount to recommend it. Its very familiarity, its consistency with the school system and with the bulk of Australian tertiary institutions, make it attractive. The scheme is flexible; the Institute has already found and utilised this characteristic by running a number of "half" units within the three-term framework, and by developing some "quarter" units fitting into existing terms. Neither of these arrangements is entirely satisfactory, but the flexibility of the three-term framework is evidenced by what has been achieved within it.

A disadvantage of the scheme is that most units offered within it are designed to take the 35 week teaching period almost as though some oracle had prophesied that this length of time was ideally suited to instruction. Continuous assessment can be applied within other frameworks, but there is certainly less pressure for a quick and effective start to the teaching programme when it is seen as stretching away for eight and half months!

A serious disadvantage of the scheme has proved to be its inflexibility in terms of summer teaching. When a unit of instruction is designed over a 35 week period it is difficult to condense it to fit within the summer "vacation". On the other hand, the relatively slow pace of the teaching programmes designed to fit 35 week periods makes it relatively easy to devise and administer parallel programmes of external study.

In summary, the existing system gives a programme in which units of instruction (subjects) are relatively large; in which there is a leisurely pace during the early part of the year; in which parallel campus/external tuition is facilitated; and in which the utilisation of the campus for summer course teaching is difficult. It is also to be noted that the system has the advantage of being familiar, and that it "fits" our established practice of schemes of study with relatively few electives, combined with a high proportion of sequenced units. The scheme is, to the extent that it has not led to the wide use of options, contrary to the recommendations of the Institute's Committee on Liberal Education.

The Semester/Summer Session Plan

It is widely argued that the richness of the learning experience gained by a student is directly influenced by his level of participation. It is also commonly accepted that motivation towards learning is directly influenced by the immediacy of the assessment provisions. Irrespective of the use of continuous, as opposed to terminal, assessment, the duration of a "subject" is therefore of concern in the motivation of students. As already has been noted, the three-term scheme allows for the use of "half" and "one-third" subjects, but their introduction within the three-term administration system imposes a number of difficulties.

One of the most evident features of the semester plan is that, although it does not force the uniform adoption of "half" subjects, it encourages their use. It is educationally and administratively designed for them; whereas the three-term scheme merely permits the use of the shorter units with some difficulty.

Provided that the class contact hours for a semester subject are not large, the period available for summer teaching under such a scheme is long enough to allow for the presentation of complete subjects, thus facilitating the possibility that a lagging student may catch up on his programme, or that a student may actually accelerate his study plan. The internal economics of either of these possibilities depends on the numbers of students offering during the summer; but the social economies are evident; to reduce the average time taken to complete a qualification is necessarily a benefit to society.

The possibility of using a semester calendar has been discussed with the Education Officer (External Studies) and with members of the academic staff engaged in this field of teaching. The Working Party believes that semester units can be taught externally, although such a practice will impose strict discipline on all concerned: students; lecturers; administrative staff; and such service units as the Bookshop and the Library.

A "pure" semester calendar would have a serious disadvantage in Australia. Most teaching institutions have adopted a break in May and in August/September. During such periods many conferences and related professional activities of interest to academic staff take place, and student bodies also use these periods for many of their joint functions. The periods have also proved useful at the Institute for presenting intensive campus-based programmes for external students many of whom are teachers and therefore available at such times. A further disadvantage of a "pure" semester calendar would be its perception by staff as "long". Most Institute staff are used to the Australian practice of teaching for no longer than 13 weeks in any one period; and the prospect of a 17 week period is alarming. For these reasons the Working Party has recommended that a modified scheme be introduced, retaining one week's break in May coincident with the school and university break; and one week in August. The location of the latter period is more difficult as the Universities and schools do not have coincident breaks at the end of second term.

Experience of semester teaching at the Institute, and elsewhere in Australia, has been very favourable (see Report to Australian Vice-Chancellors' Committee on Year-Round Teaching 1970 esp. Ch.4). Despite some initial apprehension about the pressures on students and staff created by such a system, the institutions adopting it appear to believe that the benefits are worthwhile. No attempt has been made to assess student or staff opinion at the Institute in a systematic way, but informal assessment suggests a wholehearted acceptance of the scheme amongst those who have had experience with it.

The possibility of "sandwich" type course programmes is being explored in several areas of the Institute's work, and experience in the United Kingdom suggests that such an interest will spread. One obvious feature of the semester scheme is the ease with which it can be fitted to an "end-on" course/experience pattern with the student spending one semester at the Institute followed by six or seven months gaining experience.

The semester plan has also been found valuable in terms of leave for academic staff. If the majority of Institute subjects are offered on a semester basis, it would be simpler to arrange for industrial and study leave than is the case at present. The end of the first semester early in July is appropriately placed for staff wishing to undertake study or teaching in the northern hemisphere; and the commencement of the second semester late in July would facilitate in the reverse direction.

One of the administrative issues involved in any tertiary institution is that of enrolment, and of the maintenance and revision of student records. The customary Northern American pattern is to treat each semester as an independent unit, with enrolment afresh for each period. The time pressures involved in handling large numbers of students for assessment, and re-enrolment, several times each year has led to many labour-saving techniques which contrast markedly with our labour-rich methods currently in use. The Working Party believes that, in the short run, we should retain a once-each-year enrolment pattern under which it is assumed that the student can predict his whole year's programme. Those forced to change from their initial programme by reason of health, change of address, or poor examination performance, would be required to submit "course change" documents. The Working Party also believes that the time pressures operating between the end of the first and the beginning of the second semester will persuade staff to reduce the emphasis on end-of-semester examinations, and to make the retained examinations as labour-saving as possible from the assessor's point of view. In the longer term it may be possible to devise a highly standardised enrolment procedure under which re-enrolment is feasible for each semester. This question is related to the academic question of options and subject sequences. It is to be hoped that some progress can be made towards greater availability of options, and towards less rigid sequences.

The sheer arithmetic of the 12-month calendar under which we live means that year-round teaching, with its attendant potential economies, is peculiarly difficult. The fact that the high schools produce a "crop" of entrants to the tertiary system only once each year means that we are not likely to be able to enrol new students in significant numbers more than once each year. The use of a semester scheme using a teaching year of substantially the same length as the existing year (35 weeks) also means that there cannot be a further period of semester length available for "summer" teaching. In this hemisphere, the position of Christmas further erodes the time available for "summer" teaching. The Working Party is convinced that any change made to the organisation of the academic year must facilitate "summer" teaching, and has therefore recommended a pattern under which it will be possible to achieve a six week (one third semester) summer period; and under which it may with experience be possible to achieve an eight week (half semester) period. The feasibility of either scheme depends on the availability of students, and the willingness of permanent or visiting staff to undertake the teaching.

The Quarter Plan

This scheme is a logical development from the semester calendar. If there are advantages to be gained by shifting from 35-week units to 17-week units, there may well be further advantages in reducing to 11-week units. The immediacy of assessment, and the possibility of a fourth teaching period of the same length, has led a number of United States institutions to adopt the quarter system. In Australia it would probably not be possible to achieve a fourth period of 11 weeks because of the intrusion of Christmas and the need to integrate the scheme with the customary starting and stopping dates in the general educational calendar, but the quarter system was still found very attractive by members of the Working Party.

It was also found attractive by several teaching departments, and there has been an appreciable development of "quarter" units on an experimental basis at the Institute over the past two years. For there to be any substantial progress in this direction it would be necessary to adjust the present calendar to provide three terms of equal length - a change which bristles with difficulty when one attempts to achieve a solution without distorting the existing degree of congruence between the Institute's calendar and those used by related institutions.

A serious disadvantage of the quarter scheme lies in its use for external tuition. Off-campus students are an appreciable proportion of enrolments, and the Council has adopted a policy under which our responsibility for this field of education is plain. Our experience with full-year and half-year units has been that a relatively long period has to be provided for the establishment of initial contact with external students, and that chance factors such as the non-availability of books and other teaching materials at the start of year; postal strikes; and the loss of materials in transit make it extremely doubtful that a satisfactory teaching programme could be developed under a quarter scheme.

The Working Party also foresee difficulties in a move from a system under which most units are offered over a 35-week programme to one in which units were, on average, one third of that length. Such a change would be a dramatic one indeed for both students and staff; it would be easier to contemplate if we were already on a semester plan. Our established practice of subject sequences would also have to be drastically revised under a quarter scheme, as otherwise the Institute would be offering every subject every quarter after the first year of operation - a situation which would cancel out any possible economies associated with easier summer teaching and a reduction in the average time taken for a student to complete his course.

The experience of the United States organisations which had changed from semester to quarter calendars was sought and studied. It is clear that it has not been possible to provide an even flow of students into the four periods, and that the summer period has had very disappointing enrolments. Educational advantages have been gained by the greater pressure perceived by staff and students, but there has been a substantial increase in recurrent costs without a commensurate decrease in capital costs brought about by increased throughput.

Despite its attractions, the Working Party is convinced that, at the present stage of the development of the Institute and of the Australian educational scene, the quarter system cannot be recommended.

The Trimester Plan

The Working Party found little to commend the trimester calendar. Its 15-week terms necessarily involve an inbalance in terms of the established Australian educational calendar, and it would be quite impossible to use the third trimester without extreme inconvenience during the Christmas period. Unites States experience has shown that it has not been possible to attract new students to enter more than one trimester each year in substantial numbers; and a two-trimester plan would significantly reduce the teaching year. The evidence available to the Working Party convinced us that the trimester scheme is not appropriate for the Institute, and we had no difficulty in rejecting it out of hand.

IMPLEMENTATION OF A SEMESTER SCHEME

The above arguments, together with extensive discussions in committee and elsewhere, have led the Working Party to recommend the adoption of a modified semester calendar coupled with the greatest possible use of the summer period for both course teaching and continuing education.

In preparing a possible schedule for 1973 (a formal change earlier than this is not possible) the Working Party has maintained a substantial degree of conformity with the calendars of related institutions. The following points should be noted.

1. The first semester is badly affected (it shares this with Term 1 under the present calendar) by public holidays. It is suggested that Easter must be observed, although it does not necessarily have to include the Tuesday, and that other public holidays could be eliminated. Such a change could be made in two ways: the public holidays falling in Semester 1 could be grouped and taken as part of the Christmas/New Year period, with the Institute closing completely between these two customary holidays. Alternatively, the holidays could be grouped and added to Easter, giving a full week break at that time. The latter approach would result in two week-long breaks in the first semester, and is less attractive than the idea of closing down over Christmas/New Year and merely taking Good Friday and Easter Monday during the semester. As this question is, in part at least, an industrial one, it is recommended that negotiations be entered into between the Management Board and the executive of the Academic Staff Association and the Civil Service Association.

2. The proposed "breaks" should be regarded merely as non-teaching periods in which both staff and students will be expected to be working "as usual" unless attending conferences or similar activities. The May break suggested coincides with university and high school breaks.

3. The August/September break cannot be made to coincide with both university and high school breaks. The week shown in the example coincides with the school system, but here again negotiations with staff may be valuable in ensuring that whatever pattern is adopted will cause least inconvenience. Our choice of the school period was influenced by a desire for a break towards the middle of the semester rather than at its beginning.

4. The provision of only one week for examinations at the end of each semester assumes that the emphasis on terminal examinations will be considerably below the level currently applying to end-of-year examinations.

5. The gap of three weeks between the first and second semester is thought to be sufficient. It is hoped that the first week will be enough to complete the assessment process and to advise students of their results. The final week should allow for the adjustment of programmes for students whose performance has fallen short of original expectations and for making consequent adjustments to class schedules and room loads. Much of this work will be administrative, and it is thought that the process will be so arranged as to make minimal demands on teaching staff. As the semester break occurs in mid-winter there is no point in prolonging it more than is absolutely necessary.

Once the Institute has determined its programme, it will be essential to give the new calendar the widest publicity. Substantial numbers of people will be affected by any new scheme we adopt, and a semester programme will be, for many in Western Australia, a novel idea. It is unlikely that we will be able to prevent all confusion, but a thorough public relations programme will be essential.

Although the semester calendar represents substantial educational advantages, the Working Party has been anxious to establish its probable effect on costs. As already noted, there is some evidence suggesting that a semester programme is likely to reduce the average time required by a student to complete his course, and this is clearly an advantage. But the current costs of a change to a semester programme is still to be considered. On common sense grounds, there will be marginal increases in recurrent costs associated with the necessity for revising student records twice each year. These costs will be virtually eliminated if the Institute abandons its present programme of offering supplementary examinations. With two separate enrolment periods each year there would be additional costs, but the Working Party believes that only one period is needed, with only a small additional cost to cover the enrolment changes which will inevitably arise. On the other hand, there is some evidence that the switch to continuous assessment is resulting in increasing pass rates, and this trend will be accelerated by the adoption of a semester programme.

The Working Party wrote in April to the Australian tertiary teaching institutions which have adopted a semester scheme, seeking their experience in relation to operating costs. Several institutions have had no experience under conventional calendars (Macquarie University; Canberra and MItchell CAEs); but those which have made the change see any additional costs as fully justified by the advantages associated with the semester scheme. No institution was able to give the Working Party an estimate of the cost increases, saying that so many factors were changing that it was impossible to isolate and quantify the increase due to the change to semesters.

The Working Party believes that a similar situation will apply at the Institute. Our scale of operation is increasing rapidly, and our methods of handling the administrative aspects of enrolment and student records are also in a state of flux as we move from manual to ADP methods. We are confident that the effects of the semester system will be relatively slight, too slight to be noticed amongst the other factors bearing on our administrative costs.

Supplementary examinations have not received much consideration from the Working Party, but we now draw attention to this as a matter requiring further study as experience with the semester system is accumulated. Our present policy, influenced to some extent by the sheer magnitude of the existing units of instruction, is one of a very liberal attitude towards the granting of supplementaries. The cost of the supplementary examinations is not great, and it is evident that the process does expedite the progress of some students. Against this is the encouraging trend in pass rates which seems to have been associated with continuous assessment. The wide introduction of "half units" (in terms of our present way of thinking) will enable us to make a fresh appraisal of the necessity for supplementary examinations as opposed to the alternative of forcing a student to repeat a subject in which he has been assessed at the "Fail" level. Where such an assessment has been based wholly or substantially on performance throughout the teaching period, the logic of a supplementary examination is highly questionable. The Working Party recommends that this matter receive further attention from the Academic Board.

Draft Academic Calendar 1973 Appendix 1

Semester 1

Commences Monday February 26

Break May 7 - 13

Classes end Saturday June 30

Assessment period July 2 - 7

Enrolment adjustment period July 23 - 24

Semester 2

Commences Monday July 30

Break September 3 - 9

Classes end Saturday December 1

Assessment period December 3 - 8

Summer Session

Enrolment December 17 - 18

Classes commence Wednesday January 2

Classes cease Tuesday February 12

Assessment period February 13 - 16

Semester 1

Commences Monday February 25

Notes:

1. Each semester is spread over 18 weeks including a one week break, and is followed by a 5½ day assessment period.
2. Public holidays have been ignored. They will disrupt Semester 1 by two days (Good Friday + Easter Monday) or six days depending on Institute policy.
3. There are three weeks between the end of the Semester 1 assessment period and the commencement of Semester 2.

CHAPTER 6

A FORWARD LOOK

6.1 HIGHER EDUCATION AND TOMORROW

Education is essentially concerned with tomorrow. The student's working life is years ahead, and he will perform in a different society to the one in which he is receiving his education. By necessity, if not by choice, he is being educated in the world of now for the world to be.

The central problem can be thus expressed as the development of a system of higher education which is relevant to tomorrow's needs and yet serviced by today's inadequacy of both resources and knowledge.

The magnitude of the problem, so expressed, is daunting. Unless education faces the problem as it is, in all its stark enormity and complexity, an increasing gulf will develop between the size of the task and the inadequacy of an outmoded performance.

Einstein and Infeld have said 'the formulation of a problem is often more essential than its solution'.

The reasoning behind this statement is relevant to the crisis in education. The problems have to be formulated honestly and squarely before the search for solutions can even begin. The answers will be many and varied, for the solution of one problem will inevitably lead to the creation of yet another problem. It will be a continuing process, not to be solved by any strokes of genius, the mere release of large additional resources, or new and revolutionary techniques in the learning/teaching process. These types of answer will help to solve problems only partially, because the effluxion of time changes problems. As efficient and effective as may be the efforts to find answers, they consume time; and as time is being spent irreplaceably, the world of knowledge, social aspiration and material achievement will have advanced yet further. The amount to be learnt will be always ahead of the amount which is being taught.

6.2 A NATIONAL PLAN FOR HIGHER EDUCATION

The Martin Report[1] paved the way for radical changes in Australian higher education, including the development of the Colleges of Advanced Education. However, world society is continuing to change at a remarkable rate; science and technology advance, whilst at the same time there is a growing awareness of the need to improve the quality of life - an ethos for living.

It may well be that the time has arrived for a further major investigation and report on the needs, the resources and the policies of higher education in Australia. Such an effort could well lead to the development of a national plan for the following decade.

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[1] Report of the Committee on the Future of Tertiary Education in Australia to the Australian Universities Commission, Vol. 1, August 1964

Any individual concerned with a major organisation knows that objectives (i.e. the beginnings of a plan) are imperative if performance is to be measured; and that objectives are the introduction to consideration of ways and means, the modus operandi, without which no organisation can operate efficiently, let alone achieve its ultimate aims. A national plan would not be a straitjacket, for essential ingredients would include continuing review and consequential modifications.

In the case of higher education, not only is a national plan needed in terms of resources, but also in terms of philosophy and policy. The respective roles of the different components of higher education need more adequate definition. Additionally, there is an acute need to achieve understanding and co-operation between the different components. The higher educational needs of a nation should not be prejudiced by political infighting between institutions, and puerile academic snobbishness, claimed to be in defence of academic standards but in fact concerned with academic privilege. At a national level, there is an absolute need for an educational plan, a clearly enunciated policy and philosophy, and a resolute commitment to resource allocation.

6.3 A NATIONAL EDUCATION BOARD

The primary need is an explicit governmental policy on education, which shall not be subject to political whims. Immediately, objections will be raised that changes in government must substantially influence education policy. This is only too true, but nations cannot continue to tolerate marked changes in policy in such fields as education, health and social welfare, because there has been a change of government. There can or should be changes of emphasis, modifications of procedures, but radical reversals on the major policies affecting the lives of people can no longer be tolerated in the complex world of today.

A statement of national policy in education must be all-embracing, i.e. covering kindergarten, primary, secondary, technical, tertiary and adult education. It requires to be kept constantly under review, changing in relation to the needs of society, inclusive of technological developments, the impact of the social policies (such as the working week, the use of leisure time, the retiring age) and the state of the economy. Change in response to the needs of society is a quite different concept to change made for party political reasons. Most developed countries do change policies, as the world changes, but far too rarely is it anything other than a series of ad hoc decisions made under pressure of events, and without any reference to a long-term plan of development. The inevitable result is that there is discord rather than harmony between the different aspects of education. At one period, there is a crash programme to improve the secondary system, with a diminution of funds to the tertiary; then, suddenly, it is found the tertiary is ill-equipped to handle more and better qualified entrants from the secondary. The brakes are applied and policy is reversed. Funds are diverted from the secondary to the tertiary, only to find that within a few years the secondary system is short of buildings, teachers, equipment and facilities. Illustration after illustration could be given of this type of situation occurring in country after country.

Let me illustrate an average type of system. Kindergartens are run by both private and public authorities. Primary and secondary are mainly run by governmental departments, apart from some schools financed by churches, and others run for profit or from endowments. Technical training is run by a government department. Tertiary institutions are autonomous but mainly dependent on the state for finance. Adult education often involves many authorities and is quite unco-ordinated. The decisions on the amount of finance to be granted to each segment of the system, and to particular institutions, are made by politicians who are relying to a very large extent on the professional and permanent officers of the Treasuries. Occasionally, a state appoints advisory committees, with the functions being e.g. to co-ordinate the tertiary elements of the system, or to advise on some particular field of education, such as agriculture, health or the use of computers. By and large, the advisory committees are drawn from within the system, with the inevitable result that certain ex-officio members are ubiquitous. If there is a department of education, then its officials are here, there and everywhere. Very rarely, if ever, are the committees given any administrative support, and the facts and figures, on which they make recommendations, are supplied by the institutions or departments, unchecked by any independent research and investigation. The whole advisory system is executed on the cheap, and if the recommendations made are not liked by the politicians, and more importantly by the senior treasury officers, then ways and means are found to shelve the report. A little later, the impression is given that the committee either exceeded its terms of reference, or alternatively did not possess certain confidential information, available only to the politicians and their professional advisers.

Thus there may be a case for a National Education Board, responsible to the legislature and operating in the context of a guaranteed level of financial resources, calculated as a percentage of national income. Such a Board would not be a government department but a statutory body, with precisely expressed powers and responsibilities. It would be accountable to the legislature, and thus to the people, for the efficiency with which it executes its functions. Its decision-making processes would be decentralised to such an extent as was compatible with Australia's particular governmental structure.

How should the membership of such a National Education Board be determined? In the first instance, each member should be full-time. The current practice of requiring senior executives to serve on several bodies is an absurdity; they fail in some aspects of their main occupation and their principal concern in honorary posts is to protect their own organisations. It is idealistic nonsense to pretend otherwise.

As a basis for discussion and debate, a board of twelve members is advocated as follows:

Chairman (chosen for his known outstanding ability as an educational planner)

6 members of the educational profession who between them have knowledge of the total system

1 representative of the Treasury, who shall be seconded on a full-time basis

2 leading economists in education

2 members chosen for their knowledge of general management

If this list is studied carefully, it will be found that apart from the Chairman, who is primarily to fill the role of chief executive, it gives the organisational pattern of the supporting secretariat. I would see an educationalist in charge of each different segment, i.e. kindergarten, primary, secondary, technical, tertiary and adult; the treasury representative as heading the finance division; the economists leading the research and development organisation; and the management men controlling the business and administrative divisions.

There would be regional authorities to implement in detail the policy laid down by the National Board. The regional authority would be structured similarly to the national, and there would be as much room as possible for regional initiative. Policy would be the national concern, implementation that of the region, which however would have the added responsibility of advocating changes in national policy, in the light of regional experience which is closer to the grass roots. The general philosophy of decentralisation of decision-making, within policy and budget, which I have advocated for a single institution is just as applicable to the national and regional concept.

What are the major factors which should influence national policy? It would seem as if they may be divided into two categories, which can be defined as factual data and socio-economic judgement.

The main headings for factual data would include:

* demographic statistics and estimates
* manpower surveys and forecasts
* existing facilities and degrees of utilisation
* teaching force, existing and projected
* source and capacity of supply of resources, other than human
* building design and construction
* historical records of student assessment and progress
* economic trend data
* cost analysis data

Under the general heading of socio-economic judgement, there would be such items as:

* a political decision on the minimum percentage of GNP to be allocated to education

* projections of the impact of technological change involving the teaching and learning processes

* changes in the skills and composition of the national labour force, and the working conditions likely to evolve

* social attitudes on the relationship of education to other social needs

* relationships with other countries, politically, economically and culturally

* forecasts of national development

* changes in income, taxation and social welfare policies

* sophisticated use of programmed budgeting techniques to assist in achieving management by objective.

6.4 RESEARCH AND DEVELOPMENT

For some years now, various authorities have made a limited number of research grants and a few institutions have started development units. But the truth remains that the amount of resources being given to research into education is seriously inadequate. It is a strange paradox that governments give large sums of money to higher educational institutions, without (a) developing and using appropriate criteria for the assessment of institutional performances, and (b) allocating the funds for the research and development work which, in the longer term, would reduce the per capita expenditure.

In my view, there is a need for a major national organisation for educational research, an equivalent to the CSIRO. The advancement of technological and scientific knowledge so splendidly achieved by CSIRO is not more important than a CERDO (Commonwealth Education Research and Development Organisation), for the latter would be concerned with the nation's greatest asset - the knowledge of its people. The inclusion of development, in addition to research, is deliberate in order to accentuate the need to perform as well as to investigate. Iron ore and similar resources are exhausted finally, or made obsolete by technological breakthroughs achieved by polymer chemists. The only abiding resource is human.

CERDO would need to be structured and organised along lines different to the normal. Possibly, using the Australian Council for Educational Research as the first building block, it would have a small national headquarters, staffed by researchers and decision-making administrators. Although carrying out some major projects of its own, the main role would be the co-ordination and integration of the research being carried out by institutions and individuals throughout Australia, and in maintaining close international links. It would act also as an information disseminating centre and, through its advice to governments and institutions, endeavour to ensure that research projects of value were not only executed but translated into action. It would seem desirable for it to have regional centres and, by negotiation with institutions, to be engaged in a recycling of staff between itself and the educational bodies. It would need an annual budget commensurate with the size of the task, and possibly could be the home of an Australian equivalent of the American Educational Research Investigation Centre (ERIC). However, I think it might well go beyond the latter by acting as a national clearing house, not only for research data on academic problems and policies, but also for the physical issues, as e.g. the design and construction of educational buildings.

6.5 CONTINUING EDUCATION

In many countries today, of which Sweden is a particularly good example, a shift in resources from immediate post-secondary education to continuing education is occurring. The knowledge society which is developing is the essential cause, and it may well be that in the years ahead the lives of men and women will become a cycle of work and study.

Part of the answer to the problem of educating for the future may well be the adoption of a policy of recurrent education. If a national inquiry into education were to take place, it would be essential for it to give the most serious consideration to recurrent education, which may be vital to Australia's changing role in the world. Our economy is changing markedly and the availability of a well-educated and continuously educated populace might prove to be the cornerstone to ensure not only continued material advance, but also constitute the essential ingredient in improving the quality of life.

6.6 EMERGING MANAGEMENT CONCEPTS

Management and planning in higher education operate at a moderate level of efficiency and effectiveness. Numerous techniques and methods are available for improvement, but there is only one major fundamental. Higher education is largely staffed by knowledge workers, mostly employed on managerial level salaries. Yet the bureaucracy of the rule book and the inflexible budget is predominant. It is high time that the institutions of higher education practised a simple management rule: give professionals objectives, the responsibility and flexible means by which to carry them out and then appraise them according to the strengths demonstrated. The Colleges of Advanced Education are full of people of vision and imagination, vigour and enthusiasm; the task of central management is to release these potent forces for change and innovation. Such forces would not only replace frustration with satisfying demands on talent in the field of education, but would transmit ideas into the community at large. Educationists, and the administrators associated with them, have a responsibility to society which does not stop at the boundaries of the campus; they have to be concerned and involved with the economic and social issues of the day.

In the last century, agriculture predominated; in the first decades of the 20th century, secondary industry took over. Both primary and secondary industries benefitted from the work of Taylor, called the father of scientific management, who was able to make manual work productive. His weapons were technological and managerial. Today, however, the shift in importance is to the knowledge-oriented industry, examples of which are education and research organisations. Knowledge is the base of society rather than skill and brawn. Peter Drucker has declared that the great task for the rest of this century is to make knowledge industry-productive.

It will involve radical new thinking. Autocratic management structures will disappear in favour of flat structures, in which task forces, comprised of people of a variety of abilities, will join together for a limited time to achieve a given objective. There will be inter-disciplinary approaches to the solution of problems. Men will learn from dialogue with each other. There will be more face-to-face discussions, in which talent and knowledge will count, and not seniority and power.

Those in senior management will still need to make the big decisions on policy and budget, but they will diffuse their detailed operational powers throughout the organisation[1]. In a few words, they will learn that men and women given responsibility, grow in stature.

6.7 STUDENT OBJECTIVES AND ORGANISATION

By tradition, a tertiary educational institution is an academic community, of which the students are an integral part. This is the ideal to which all give allegiance, in speeches and declarations, and it is true that some universities, and similar institutions, have come close to achieving the ideal. But, for the majority of academics and administrators, it has never been more than the expression of a pious hope, which sounds rather good but is not to be taken too seriously. Indeed, there is a lot of evidence to suggest that students have been somewhat of a nuisance to administrators, preoccupied with balancing budgets, and professors devoted to their particular areas of research. At best, the students are tolerated if they are full-time, and resented if they attend on a part-time basis.

This situation is a little reminiscent of religion. The believer never wearies of preaching the virtues, but rarely tries to practise his beliefs. It is rather ironical that the only major nation which devotes tremendous efforts to moral education is Soviet Russia, where the churches are barely tolerated.

If one accepts the traditional idea of an academic community, which includes students, then we immediately realise the demand for a voice for students in such a community is not a revolutionary proposal - it is simply a request to stop play-acting and to equate the reality with the ideal.

This is the principle which must be determined, before any consideration can be given to the methods of achieving it. Is the student a member of the academic community or not? If he is not, then what is he?

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[1] At the time of writing this report the Western Australian Institute of Technology has begun a major investigation into its organisational and decision-making structure.

If the authorities decide he is a member of the academic community, then his rights have to be assessed in the light of such a principle.

If the authorities decide he is not a member of the academic community, then they must cease to use the phrase altogether. Having ended the hypocrisy, they must then enunciate a new principle, which inevitably will be that the student is not to be regarded as adult and responsible, but a juvenile to be governed by adults.

Gradually, the position begins to clarify. The tertiary student is responsible, according to our traditions. In his own eyes, he is responsible. In terms of government, he is responsible, he can be directed, conscripted, imprisoned - as an adult. In the researchers of the sociologist, the youth of today are seen as more mature than their predecessors. Thus, the evidence accumulates to support the tradition. Last, but not least, there is a need to face the reality that the young demand the achievement of the tradition, and not lip-service to it, and they have the power to enforce their demand.

My own view is clear. The principle is established by the argument of tradition, usage and modern development; it is reinforced by power. The only questions worthy of debate are those involving the methods of achieving the principle.

Internally, the three major factors are curricula, examinations and discipline. For my part, I consider the detail has to be worked out by each governing authority with its respondent student body but, in essence, strong student representation must be included in all internal committees dealing with curricula and examinations. As far as discipline is concerned, the long-term policy could well be to leave it entirely in the hands of the student body, although it may be necessary for this to be achieved through a series of evolutionary stages. It is surprising how rarely is considered the abundant evidence that discipline exercised by one's fellows is more efficacious than that exercised by a superior.

This far, I have ignored the availability of resources and their allocation, and the role which students have in such matters. In the first instance, it is obvious that student representation must be present on the governing council, for only thus can the student body become aware of the problem, and begin to share in the responsibilities of decision-making in the process of which, inevitably, universal popularity is impossible. Demands will always exceed resources in all aspects of society, and thus some demands cannot be met. Some must be dissatisfied. In all aspects of life, a power of ultimate decision must exist. Otherwise, decisions would never be made. The more the discussion and consultation which have taken place, the more likely that any decision will be better. However, the extent of discussion which takes place depends on the time-scale involved, and the quality of the consultation depends on the knowledge of those involved.

In the setting of a tertiary educational institution, this must be intepreted as resulting in a position in which the governing council must have the power of ultimate decision, constrained as this may be in the single issue of the amount of resources obtained from government. A student representative would be on the Council (as is now becoming common practice) but, in the future, the representation is likely to be more substantial. A single representative can be isolated too easily. In all matters the executive arm of the council must have enabled wide discussion to have taken place, and to have ensured that those participating are as well informed as is possible. Only in emergencies should discussion be limited, and rarely should this be the case in an educational institution. It hence follows that the executive should regularly consult with the student body.

A careful analysis of most decisions will indicate there is very little in a tertiary instituion which is of such a confidential nature as to prevent the consultative process. Too often, in fact, is secrecy applied where there is little need for such secrecy - and this may be true of more organs of government than just education. A well-informed public is probably the only guarantee of a reasonable measure of democracy and efficient decision-making.

However, if wide discussion in the student body is to take place, it must be well informed, and that places a great responsibility on the executive to keep its communication lines open and, to the greatest extent possible, ensure that its communications are thorough and honest.

Up to now, my concentration has been on the role of the student body in the power structure of the organisation. It is now appropriate to consider two other important aspects of student objectives and organisation.

A tertiary instituion without a virile and imaginative student body is akin to a hobbled horse. Student activity breathes life into an institution; it gives a breadth, a depth and a colour which are enriching and immensely valuable. Nowadays, there is much talk of liberal education because, in a world in which specialisation is so important, there are dangers of the educational system producing graduates who are experts in a given field, but ignoramuses in subjects outside their speciality.

It is impossible to argue against specialisation. The rapid increase in technological knowledge, and complexity of fields of study, have necessitated specialisation. Whilst the curriculum can be structured in such a way as to include elements of liberal education - which, for my purposes, means the development of a free man able to participate in the community - the student body's activities are of equal, if not greater, importance.

Through the students come the extramural activities, such as drama, music, debate and sports, and all of these - and the dozens of others - contribute to ensuring a climate of study and development in which specialisation is an apex, and not a foundation stone.

Every man needs to know his own language, the rich cultural gift of aeons of time, expressed in the everyday conversation of the marketplace, and also in the soul-stirring experience of great poetry, drama and literature. History becomes alive in the pages of a great writer.

If the written and spoken word are part of our culture, so too is the expression of art, in all its forms, and hence the need to feel the emotions engendered by a painter or a sculptor

Today, students are interested in politics, and let us thank the heavens it is so! A campus alive with political ideas and debate will be one in which the free spirit of man can be expressed, and it will aid the community at large not only to realise the immense importance of public knowledge and debate, but also to understand that tolerance of another's ideas is an essential in a society which aspires to greatness.

If there are political clubs, and debating societies, let them deal with the big issues - and let there be excess of zeal and spirit. If a man or woman in his early years does not feel and think deeply on the structure of society, then he will always be restricted in his self-development, which is one of the great purposes of education.

Each institution will develop a student organisation relevant to its own needs. By and large, I feel a student organisational structure should be federal in concept, i.e. its affiliated clubs and societies should be autonomous over a range of activities, but responsible to the central body on major aspects of student policy.

Even in the work associated with student bodies, a great deal of value in education for life will be gained. The student counsellor will learn that his problems are similar to those of the members of the executive and the governing body. He will have to make decisions. He cannot be popular with all.

What does the future hold? I see an integration occurring, in which student responsibility has its place alongside staff responsibility, and that of the governing body. Today, the catch-phrase is Administrators v Academics v Students. Tomorrow it should be Administrators + Academics + Students - but not necessarily in that order!

If the tertiary educational institution cannot achieve wholeness, but remains a collection of opposing groups, then what other part of society is likely to achieve it?

6.8 CONCLUSION

This study tour report has ranged far and wide. It has put forward a considerable number of specific recommendations; in addition, many theories have been postulated and many ideas presented in embryonic form.

In conclusion, may I briefly reiterate a personal conviction. If there is one single essential in Australian society today, it is the great need for far wider public discussion on all the major issues which confront education. The big decisions which will affect the lives of people and the future of our nation should be taken in the light of open and public discussion.

APPENDIX A

INSTITUTIONS AND INDIVIDUALS MET AND ENGAGED IN DIALOGUE

SINGAPORE

University of Singapore

Dr. R. Quake	Deputy Vice-Chancellor
Hugh D. Lewis	Registrar
Professor S. Van Embden	Head of UNESCO team (advising master plan for new site of University)

Ministry of Education

S'ng Yew Chong	Director, Technical Education Department

Government of Singapore

Dr. Toh Chin Chye	Minister for Science & Technology (Also Vice-Chancellor of University, and Chairman of Singapore Polytechnic)

Singapore Polytechnic

Robert Edis	Principal
J.B. Rajoo	Assistant Registrar and Bursar

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HONG KONG

Winston Tsang	Chinese businessman

Hong Kong Productivity Centre

Alan Y.T. Chee	Public Relations Officer

University of Hong Kong

D.M. Dudgeon	Senior Assistant Registrar
Mrs. Jean K. Richards	Administrative Assistant

University Grants Committee of Hong Kong

S.F. Bailey	Secretary (Also Secretary and member of Planning Committee for Hong Kong Polytechnic)

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USSR

MOSCOW

Leonid Orlov	Political commentator and writer (Expert on USSR-Australia relationships)

Academy of Sciences, USSR

Professor V.A. Zhamin	Vice-Director, Institute of Economics
G.M. Popov	Scientific Secretary to Institute of Economics

Ministry of Secondary & High Education, USSR

Professor V. Chuprounov	Director of Department of Planning and Finance (accompanied by First Secretary)

LENINGRAD

Leningrad Institute of Technology

Professor P.G. Romanov	Pro-Rector
	Two anonymous students in USSR university

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SWITZERLAND

GENEVA

UNESCO International Bureau of Education (Geneva)

J. Vaska	Director (Member of UNESCO Secretariat, Paris)
Miss Berney	Librarian

International Labour Office (ILO)

I.A. Ibrahim	Chief, Human Resources Department, Management Development Branch
Mr. Kubr	Staff member, Human Resources Department, Management Development Branch
John W. Grainger	Chief of Kenya Management Training & Advisory Centre
Professor Kenneth Walker	International Consultant for Labour Studies

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UNITED KINGDOM

Major-General R.F.K. Belcham CB, CBE, DSO	Chairman & Managing Director G.U.S. Export International Ltd.

Department of Education & Sciences, London

P.D. Dudley	H.M.I.
Dr. Maurice E. Sprinks	H.M.I. (in charge of Architects & Building Branch)
A.D. Collip	H.M.I.
Nicholas Summers	Principal (Finance & Planning)

University Grants Committee, London

K. Berrill	Chairman
R.C. Griffiths	Deputy Secretary
Mr. Thomas	Finance Officer
Miss Senior	Administrative Assistant

Brunel University

Professor John Vaizey	Professor of Economics

The Polytechnic of Central London

H.G. Jelf CBE	Secretary and Chief Administrative Officer
K.N. Houghton	Academic Registrar

Royal Academy of Dramatic Art, London

H. Crutwell	Principal
P. Woodham	Production Manager

University College of London

Lord Annan	Provost
Professor D.V. Lindley	Professor of Statistics

The Polytechnic of North-East London

Eric E. Robinson	Deputy Director (Planning)

University of London Institute

Dr. G.W. Miller	Department of Higher Education

Committee of Vice-Chancellors and Principals, London

K. Davies	Research Officer

The Open University

A. Cristodoulou	Secretary
Professor Brian Lewis	Educational Technology
D.N. Gollam	Assistant Director, London Regional Headquarters
Mr. Martin	Planning Officer (Architecture)
Mr. Richards	Deputy Finance Officer

Bath University of Technology

G.S. Horner	Secretary and Registrar
M.W. Davies	Assistant Secretary
E.F. Denbury	Assistant Secretary
Roy Ling	President Student Union (accompanied by members of the Union Executive)

University of Warwick

A. Rushton	Assistant Registrar
Professor G.K. Hunter	Professor of English

Oxford University

Sir Folliott Sandford KBE, CMG	Registrar
P.P. Streeton	Warden Queen Elizabeth House
R.G. Feltham	Sub-Warden, Queen Elizabeth House

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FRANCE

PARIS

International Institute for Educational Planning (UNESCO)

Charles Berkowitch	Acting Director
Dr. Ta Ngoc Chan	Senior Staff Member
Dr. B.C. Sanyal	Senior Staff Member
Claude Tibi	Director of Training
Jacqueline Schwab	Librarian
John Hall	Publications Officer

Organisation for Economic Development and Co-operation (OECD)

Ladislav Cerych	Finance and Planning

UNESCO: Department of Educational Planning and Financing

S. Lourié	Director of Division of Educational Planning and Administration (EP)
M. Rieff	Senior Staff Member
Dr. Michael Huberman	Senior Staff Member

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CANADA

TORONTO

Ontario Institute for Studies in Education (OISE)

Dr. R.W.B. Jackson	Director
Dr. John Holland	Chairman, Department of Education (Planning)
Dr. Roby Kidd	Chairman, Department of Adult Education
Professor Trevor Wigney	Professor of Sociology
Mrs. June Armstrong	Conference Officer

Ontario Department of Education

George C. Peet	Education Planning and Analysis Branch
Gorden Fawcett	Applied Arts and Technology Branch

Ministry of University Affairs

Dr. D.T. Wright	Chairman, University Affairs Committee
Dr. E.E. Stewart	Deputy Minister
Ross Crake	Finance Officer

Metropolitan Toronto School Board

W.J. McCordic	Director and Secretary/Treasurer
Dr. Gerald Ridge	Director of Capital Programmes

George Brown College of Art and Technology

G.E. Armstrong	Vice-President (Administration)
Dr. R. Gwilliam	Executive Assistant to President

Systems Research Group (SRG)

Professor R.W. Judy	Principal
George Mowbray	Principal
William Sceviour	Senior Systems Analyst

Ryerson Polytechnical Institute

D.L. Mordell	President
David Brennan	Executive Assistant to President (Public Relations)
J.R. Gorman	Executive Assistant to President and Secretary to Council
A. Wilkinson	Vice-President (Academic)
D.H. Bazely	Comptroller
G.E. Barr	Director of Finance
J. Ezyk	Director of Campus Planning
W.M. Rayner	Personnel Officer
J.A. Wargo	Registrar
L.B. Morre	Director of Computer Services

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U.S.A.

Harvard University

W.G. Anderson	University Marshall
G. Wiggins	Vice-President (Administration)
Kenneth O'Brien	President of Institute Students Council
Marshall Strauss	Committee for Students and Community Relations
George Leslie	Associate Comptroller
W. Goyette	Planning Officer (Architecture)
Harold Kellog	Assistant Planning Officer (Architecture)

NEW YORK

International Council for Educational Development

Dr. James Perkins	President
Phillip H. Coombs	Vice-President (Also Research Director, IIEP, Paris)

City University of New York (CUNY)

Dr. T.E. Hollander	Vice-Chancellor (Budget and Planning)
Dr. T. Healy	Vice-Chancellor (Academic Affairs)
Dr. Seymour Hyman	Deputy Chancellor

City University of New York (CUNY) (contd.)

Robert Moulthrop	Assistant Director
Jean Louise d'Heilly	Member of Board of Regents
Joseph Meng	Dean for Student Services

WASHINGTON

Office of Education

Timothy King	Programme Specialist, Institute of International Studies
Dr. Preston Valian	Deputy Associate Commissioner of Higher Education
Dr. Wayne Reitz	Director, Division of University Programmes
Dr. Ward Stewart	Director of Facilitative Services Division
Richard Holden	Director, Division of Academic Facilities
Frank Smardak	Assistant Co-ordinator, Educational Resources Information Centre (ERIC)
Charles Mivsar	Educational Resources Information Centre (ERIC)
Theodore Drews	Chief, Higher Education Survey Branch
Dr. Salvatore Corrallo	Senior Staff Member, Higher Education Branch
Dr. Winslow Hatch	Co-ordinator, Higher Education Research and Training Division

George Washington University

Miss Nancy Lewinucha	ERIC System

American Council on Education

Richard Humphrey	Director Programme Development

BERKELEY

University of California, Berkeley

Dr. L.L. Semmet	Vice-Chancellor of Research
Lindley Sale	Assistant to the Chancellor, Building and Campus Development (B)
Dr. Glen Grant	Assistant Vice-Chancellor (Administration)
Joseph Carvan	Staff Co-ordinator, Office of Vice-President (Administration) (V. of C.)
Loran Furtado	Assistant Vice-President and Division of Budget (V. of C.)
Donovan Smith	Specialist in Physical Planning (V. of C.)

University of California, Berkeley (contd.)

Dr. Frederic Balderston	Chairman of Centre for Research and Management Science and Professor of Business Administration (B)
Dr. Orvin Campbell	Vice-Chancellor of Business and Finance (B)
B. Barker	Student Advocate (B) (accompanied by other students)

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APPENDIX B

PROGRAMME PLANNING BUDGETING SYSTEM

1 The following is an extract from a Treasury Board of Ontario publication issued in October 1969 entitled "Effective Management through PPBS". The extract is concerned with the application of PPBS to multi-year planning.

". .1. Introduction

Programming is the development of a comprehensive timetable for the implementation of proposed and approved plans. In it are clearly spelled out the resource requirements and the direct results expected. In a P.P.B. system the programming device employed is called a Multi-Year Program and Financial Plan, or, as it is usually called, a Multi-Year Plan. The discussion of the Multi-Year Plan in this Chapter is divided into two sections: the first dealing with general principles; the second giving some detail concerning the proposed timing and content of the Multi-Year Plan for the Ontario Public Service.

2. Purpose and use of Multi-Year Plan

As the basic programming device, the M.Y.P. is an expression of the anticipated accomplishments (achievements, outputs, benefits) together with the costs, physical and human resource requirements projected for a number of years into the future. The departmental M.Y.P. is a combination of all Programs to be undertaken by the department and the government Multi-Year Plan or simply M.Y.P., is a combination of all Programs to be undertaken by the Ontario Government.

The range and level of Programs included in the Multi-Year Plan does not indicate a rigid commitment for all years of the plan, but the first year of such a plan must provide good operational guidelines for the preparation of spending estimates, taxation proposals and fiscal policies, and performance targets for the year. Put another way, a Multi-Year Plan is the translation of abstract plans into working schedules in such a way that operating departments can schedule their next years' activities realistically.

The programming process envisaged for the Ontario Government is not a strait-jacket designed to produce a high degree of central control over departmental operations. Undertaken within the context of policies and priorities established by the Cabinet, it is seen as a complementary development in which the Department of Treasury and Economics provides economic and fiscal guidelines, while the operating departments present alternative work programs designed to meet their Objectives. It is unlikely that the guidelines and various departmental work programs will be initially compatible. They can be made to fit in several ways and each set of possible compromises or adjustments constitutes an alternative government work program package. To develop these alternatives, to discuss possible adjustments with the departments concerned, and to prepare the material for consideration by the Cabinet Committee on Policy Development is a task carried out jointly by staffs reporting to the Senior Advisers to that Committee; the Secretary to the Cabinet, the Deputy Treasurer and Deputy Minister of Economics, and the Secretary of the Treasury Board. The original departmental proposals and their alternatives are forwarded to the Cabinet Committee on Policy Development for consideration and the Committee's recommendations are passed to the Cabinet for approval. Guidelines for expenditure estimates for the ensuing budget year and general direction for the balance of the period will then be issued. In the programming process, the desire to fulfill departmental Objectives quickly through higher levels of Program activity is tempered by the restrictions imposed on the Programs by constraints in resource availability. Certain Programs of highest priority may be emphasized whereas others of lesser priority may be restricted or curtailed. Statements on the order of priority employed in programming the Multi-Year Plan should be contained in the plan recommended by the department, and in the overall government Multi-Year Plan reviewed by the Cabinet Committee.

By the adoption of this procedure, the basic decisions concerning operating and fiscal policy for the next year will be made earlier. Such action will provide all operating departments with a better opportunity to complete the detailed scheduling of their operations in time for Estimates submission.

Although only the first year of any Multi-Year Plan is used directly as a basis for scheduling operations, the tentative projections as approved for future years provide departments with the basic information for their internal programming of manpower development and other preparations for future modifications, additions or deletions in Programs and Activities.

The preparation of a Multi-Year Plan is one of the principal methods employed in the P.P.B. system for providing pertinent data to the policy making bodies within the government. Through it an integrated review can be undertaken of:

- carefully analyzed programming alternatives,
- the future consequence in terms of costs and benefits of present programming decisions, and
- the effects of limited availability of funds on Program levels.

This integrated review will contribute to a better background for decision-making."

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2. The following are extracts from a United Kingdom publication issued by Her Majesty's Stationery Office in 1970 entitled "Output Budgeting for the Department of Education and Science - Education Planning Paper No. 1". These have been chosen to illustrate the possible use by government of PPBS in making resource decisions on education. It is noted that for all practical purposes,

the term 'output budgeting' may be taken synonomously with PPBS.

"...THE NATURE AND PURPOSE OF OUTPUT BUDGETING

What is Output Budgeting?

Output budgeting is one of a number of tools which have been developed to help in the planning, management and control of public expenditure and of the resources used by the public sector. There is no universally accepted definition of the terminology used, and in particular 'output budgeting' has been used with different meanings in different contexts. This section therefore sets out to explain the essentials of the output budgeting approach and to define the sense in which particular terms will be used in this report. The approach adopted in this report is broadly in line with that set out in a paper by Alan Williams[1] for the Centre for Administrative Studies.

Output budgeting is in fact a general approach rather than a particular technique. Its specific contribution is to bring together the objectives of a particular service and the resources being devoted to them, and to provide a framework within which the costs and advantages of possible policy choices are examined side by side. An output budgeting system is a policy tool, and as such is naturally concerned mainly with future expenditure. As the then Joint Permanent Secretary to the Treasury wrote when he first suggested that some departments might consider output budgeting:

> 'When Governments took less of the country's resources than now, the main question was whether they should do more. As they have taken more and more resources, that question has been changing into one of making choices, rejecting one thing in order to be able to do another. Governmental arrangements for deploying and using information for major decisions and choices have been developing correspondingly in the same general direction, through long-term forward costings, the Public Expenditure Survey Committee and forward planning limits on main programmes. The more that the nature of decisions becomes that of choice, the more important it is for the Government and for departments in their own interest to have their information deployed to make the implications of choices clear; and the more important it is to have the information in a form which is suitable for considering what value is obtained for the outlay.'

Traditionally, budgets have categorised expenditure by the type of resource on which it is to be spent - staff, buildings, materials and so on - rather than by the purpose for which it is to be spent. The aims of an output budgeting system may briefly be stated as being to analyse expenditure by the purpose for which it is to be spent and to relate it to the results achieved. It is a formal system for establishing:

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[1] C.A.S. Occasional Paper No. 4, Output Budgeting and the Contribution of Micro-Economics to Efficiency in Government, H.M.S.O., 1967

(i) what a department is aiming to achieve - what its objectives are - in the areas of policy for which it is responsible;

(ii) which activities are contributing to these objectives;

(iii) what resources, or inputs, are being devoted to these activities;

(iv) what is actually being achieved, o hat the outputs are.

The introduction of output budgeting is one way of carrying further, within a block of expenditure, the ideas implicit in the annual work of the Public Expenditure Survey Committee ('PESC')[2]. By international standards the PESC survey is already a sophisticated method of examining public expenditure, at least in some respects; it looks forward for five years, deals generally with all public expenditure rather than central Government expenditure, and groups expenditure into functional blocks. The PESC forecasts are considered in conjunction with annual assessments of the economic prospect over the same period. Output budgeting can take this further in particular areas by relating expenditure to objectives, rather than simply to functions, by looking at what is being achieved, and by taking into account, where appropriate, costs other than public expenditure costs.

Output budgeting has to be considered as a system, and not just as a new way of setting out the tables of figures in respect of public expenditure. The whole system is intended to ensure that the objectives underlying the programmes are reviewed regularly, that the necessary studies are carried out to establish the effectiveness of what is being done, and that alternative policies are properly examined and costed. The nature of the system is perhaps better described by the name used in the United States, with Canada the only country[3] which has applied the technique on a significant scale outside the defence field, a 'planning-programming-budgeting system'. The name emphasises that it links expenditure with the planning process and with the attainment of objectives. In some ways it conveys the flavour of what is useful in the technique better than 'output budgeting' if the latter term is taken to imply that all outputs must be specifically forecast in advance and measured after the event.

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[2] See the Green Paper "Public Expenditure: A New Presentation", Cmnd 4017, April 1969, for an account of these surveys.

[3] In those countries a considerable amount of attention has been given to the use of P.P.B.S. in providing for the first time forward estimates of expenditure for a number of years. In this country such forward projections are already carried out; it may, however, be noted that the Ministry of Defence have found that their system of output budgeting has improved the accuracy of their forecasts.

There are three essential elements in output budgeting:

(a) the allocation of expenditure to programmes which are as closely identified as is practicable with objectives. This is the programme budget which shows, for each programme expenditure - proposed, forecast or actual - and whatever quantitative measures of output can be meaningfully constructed and used on a regular basis;

(b) the systematic review of programmes on a regular basis[4]. This includes the questioning of the continued validity of the objectives as well as consideration of alternative ways of achieving them and of the progress so far made;

(c) special studies, either to establish the value for money of alternative ways of achieving the given objectives, or to evaluate the progress made towards achieving particular objectives if this information is not available on a regular basis.

Output budgeting in its early years will naturally concentrate on the construction and discussion of programme budgets, since in many, if not all, areas of activity the measurement of final output presents formidable conceptual and practical difficulties. A programme budget constructed as part of an output budgeting system will be similar to what has hitherto been known as 'functional costing'; the essential difference will be that the functions are related to objectives rather than to the institutional pattern as is the functional costing at present used in the PESC education block[5]. An output budgeting system could however be progressively developed as and when assessment of output was carried further and new measures of output were devised; the extent and speed of this development would depend on the field of application."

"... The Value of Output Budgeting

The objectives of output budgeting in the policy-making process may be summarised as follows:

(i) to show the existing deployment of resources, setting out a Department's general strategy and enabling existing programmes to be kept systematically under review;

(ii) to build into the planning system the questioning of benefits and effectiveness, and consideration of possible alternatives, when decisions are made;

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[4] The PESC system, including the 'costed options', at present performs an analogous role for public expenditure as a whole. The programme reviews would do the same for a block of expenditure in greater depth. In the U.S.A. and Canada annual submissions are made to the Bureau of the Budget in Washington and the Treasury Board in Ottawa, on a programme basis, supported by programme review documents which survey the whole field and argue the case for the particular appropriations proposed.

[5] The present PESC classification is considerably more 'objective oriented' than was the U.S. expenditure classification before the introduction of programme budgeting. The classification of objectives in the U.S. programme budget for education is still closely linked to types of educational institutions.

(iii) to raise systematically questions of policy choice and to suggest areas for more detailed studies.

The programme budget is essentially concerned with the first of these objectives. It does not however of itself help with answering, as opposed to posing, policy choices; nor indeed will it automatically stimulate all the questions about such choices which can be asked. The format of the programme budget may also be used to record additional proposals for more, or for less, expenditure on particular objectives, as well as to record decisions already taken. Such additional proposals will frequently require special study to establish their full cost and their effect on output; the information assembled for the construction of the programme budget may however help in making such studies. The Ministry of Defence - the only department in the U.K. to have experience of operating a programme budget - have found that the raw material in their programme budget has enabled them to know at short notice what would be the effect of major changes in policy; it does not provide precise costing, but where necessary a separate costing exercise may be mounted drawing on the programme budget information in a far shorter time than would be feasible if it had to be done from the beginning.

Output budgeting provides a framework within which it becomes possible to keep existing programmes under continual review and to assess systematically how resources are being used. The programme budget can also show the policy-maker where an increase in one programme may imply a reduction in another: a development of nursery education in educational priority areas might mean not providing at existing standards for the increase in population, just as raising the school leaving age will mean worsened pupil-teacher ratios for a few years in the schools generally.

Output budgeting can often suggest improved methods of assessing the success of a programme of expenditure. Some examples may help to illustrate this. The objective of the roads programme may be stated (in general terms) as the improvement of transport facilities. This improvement cannot appropriately be assessed in miles of road completed; a motorway might have been built in a place where existing services were already adequate or where its existence led to increased rather than decreased traffic congestion. More appropriate measures of success are reductions in the time and cost of journeys, lives saved and injuries reduced. These things can be measured in relation to the existing roads programme, and changes in them as a result of further programmes can be assessed. An argument on analogous lines leads to the conclusion that the effectiveness of the housing programme may best be judged, not by the number of dwellings built, but by the number of households housed (and re-housed).

One of the values of the output budgeting approach is that it concentrates attention on final objectives and, where they can be measured, on final outputs, not just on indicators of immediate output. The latter can be misleading if they are not checked against final objectives. The numbers of medical and nursing staff per hospital bed are sometimes used as a 'quality of service indicator. Yet they are really an indicator of workload, and their use as an indicator of quality of service not only implies that the more doctors and nurses are employed the better, *ipso facto*, the hospital service will be; it also by implication precludes the hypothesis that other inputs may improve the quality of the service, and the possibility of testing the efficiency with which hospital staff are used, since every increase in staff represents automatically an increase of quality *pro rata*. What is needed is rather an assessment of the contribution which each kind of input makes to the objective or objectives in question. One objective of the Health Service is a reduction in mortality and morbidity rates: these can be measured, and their implications for improved lifetime earnings and for increased contributions to production can be evaluated[6].

An output budgeting system can be especially valuable where different institutions contribute to the same objective. The programmes in the programme budget will bring together the activities of the different institutions, and so may reveal and compare alternative means to the same end which had hitherto been obscured by branch or departmental boundaries. The Ministry of Defence have certainly found this a most useful feature of their system. On the other hand this feature, which enhances the value of the system as a planning and policy instrument, might also prove a handicap if it were also to be used for purposes of control, in the sense of ensuring that actual expenditure coincides with plans; in general the actual control of expenditure must be tied to the institutional structure. Output budgeting is primarily conceived of as a planning and policy tool: the extent to which it can be used for control will, because of the point just mentioned, vary from area to area. Nevertheless it may help in control insofar as it enables outturn to be set against forecasts in respect of both expenditure and output, and not just the former as is normally the case at present.

An output budgeting system can provide a comprehensive framework within which the overall disposition of resources can be reviewed in relation to what they are supposed to be achieving, the main areas of policy choice can be considered systematically, and individual research and cost-effectiveness studies can be mounted. It provides a link between policy planning and resource allocation. As has already been said, it will not always be easy, or even possible, to measure final output; but many of the benefits of an output budgeting system do not depend on the success of such measurement. Indeed, those who have been concerned with output budgeting systems in operation, both in the United States and in the Ministry of Defence here, are convinced that one of the most important results is not the system itself but the effect that it has on the general approach adopted to decision-making - the increased questioning of objectives, the consideration of alternatives and the efforts to gauge success.

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[6] This example is taken from C.A.S. Occasional Paper No. 4. Measurement of the things referred to would not be regarded as a complete assessment of the output of the hospital services. A complete measure may not be attainable: on the other hand, the measures which can be taken may well be sufficient in relation to most decisions which have to be made.

It must however be emphasised that output budgeting is not a mechanistic system which attempts to replace human judgement. It is intended to obtain, analyse and process the available information in such a way that the material is presented to the decision-maker in a more meaningful way, so enabling him to exercise his judgement and common sense to better advantage."

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3. To illustrate the applicability of PPBS to a single institution, I quote below from an address given by Dr. E.Z. Hirsch to a Conference organised by the Organisation for Economic Co-operation and Development. The detail concerns the University of California:

"... A Multiyear Program Budget

To be useful a program budget must have an adequately long time horizon. A simple projection of the most recent budget is insufficient. Instead, just as the program budget for this year should reflect commitments resulting from a careful consideration of alternatives, a budget for future years requires a view of the world of tomorrow, an evaluation of the pros and cons of alternative programs and activities, the selection of the most desirable ones, and assessment of implications of each year's decisions on future resource use. Thus the ideal program budget for a given year assumes that major analytical studies have been carried out and used to determine the detailed budget. A multiyear program budget assumes furthermore that such analytical studies have been carried out for a sequence of years and that based on these studies a set of preferred programs has been selected and their annual cost implications have been projected into the future.

These analytic studies are incorporated in a program memorandum, which provides the analytic backup for the subprograms and the sub-subprograms incorporated in the multiyear budget, ideally stated in terms of resource and monetary cost as well as output. Program memoranda should serve as basic planning documents not only for top management but throughout the education enterprise. Moreover, they should be regularly updated to provide current statements of objectives, programs, costs and output.

A few words should be said about what data we like to place in a multiyear program budget. Of course, we are interested in monetary figures. We would like to have not only agency cost data but some information on social costs; however, social cost data are very seldom available. As a matter of fact, we seldom have even agency cost data but must use instead either expenditure or obligational authority data. Capital and current cost or expenditure data should be given separately, whenever possible, for better understanding of the timing or implications of education decisions and guidance in bond issuance and taxation policies. In addition to this, which we call the multiyear financial program, we would like to have a physical program: separate tables prepared to include information on the projected resource requirements - number of personnel required for each year of the plan, classroom and other space requirements, etc.

Finally, we would like to point to the need for a multiyear output statement, which should give some indication of the products implied by the decisions. Since measurement of education output is extremely difficult, some proxies will be required. The proxies for primary, secondary, and higher education might be the number of graduates with specified achievements, possibly broken down by target groups. Library services output may be approximated by the number of books circulated.

This brings us to a discussion of multiyear program budget projection models. The options open to education, particularly in such an intermediate length period as the next five years, are not as many or as great as one would sometimes like. All too often merely small changes are possible. However, under such circumstances it is somewhat easier to build a program budget projection model. The model should include the following parameters, among others: staff and staff wages and salaries; facilities and their construction costs; physical plant and the costs of maintaining and operating it; library books and their prices; etc. These parameters are basically related to the number of students to be educated, quality of education, nature of the staff needed, subject matters to be taught, scheduling and size of classes, scheduling of students in other facilities, book requirements, nature of the education process, etc."

"... Ideally we would want to transform this simplified model into a rigorous general equilibrium model, preferable in equation form, which would permit policy variables, and therefore coefficients, to be varied explicitly and simultaneously and their appropriateness to be judged in terms of overall performance criteria. Policy variables could then be manipulated to determine a preferred set of programs and to estimate their budget implications for a future period. Such a model would give expression to the interdependence of crucial variables and would help to estimate costs, which in turn would be compared with separately estimated benefits. Tradeoff analyses could be made in relation to such variables as different class sizes, changes in the existing single salary schedule, alternative frequencies of the use of facilities during the day and the week, and different policies to reduce dropouts and increase the speed with which students gain degrees. Such tradeoff analyses should be made assuming each of various salary and price levels in the future. To the best of my knowledge work along these lines has only begun, and how successful and fruitful the work turns out remains to be seen.

Two separate questions could be asked in this connection: 'What are the costs and benefits associated with changing coefficients, for example, students per instructor?' and 'What are the costs of changing the quantity or quality of key outputs which may involve changes in such coefficients as students per instructor?' The parallel in conventional economic theory is that between asking about 1) costs and benefits of changing one input factor in a production function and 2) costs associated with an increase in output of specified magnitude. The differences between the two approaches can be negligible for very small changes but important for large changes. However, serious difficulty may be encountered in the first approach if optimum coefficients of other policy variables do not remain constant when the one under consideration changes.

Finally, let us turn to statements of the future output of education. Such statements related to instruction are very hard to make and related to research are virtually impossible. However, tables can be prepared of the number of students graduated in different disciplines and with different achievements. This information is superior to enrollment figures. For example, it costs the State of California $7,140 in the University of California and $5,800 in the State College system to give a student a four-year education. Clearly, the quality of the education differs. Furthermore, 55% of the students who enter the University graduate after 4 years, compared with 50% of those who enter the State Colleges. Thus 1,818 students must enter if 1,000 of them are to graduate from the University of California, while 2,000 must enter the Colleges. Therefore, about $9,210 in subsidy will be required to graduate a student from the University and about $7,730 from the Colleges.

Such output information should help in some tradeoff analyses. Important issues are: Is it efficient to have many students work while in college? How high are the capital and operating expenditures per student, if a bachelor degree is obtained in 3½, 4 or 5 years? Can incentives be devised to expedite the education process and do gains from them exceed their costs?

Conclusions

The program budget is a promising tool for planning and managing the education enterprise, particularly if it is used in conjunction with thoughtful analysis to assist in the design, development, and consideration of alternative approaches to education.

It should be clear, however, that program budgeting of education is in an early stage of development and that it presents more severe difficulties than did defense planning, where programe budgeting was pioneered. Among the complicating factors are: education in many countries is a cooperative effort between numerous governments, and thus complicated inter-governmental fiscal relations often prevail; unlike defense, where obsolescence requires that entirely new capital investments be made every five to ten years, education facilities and equipment are merely undergoing minor changes; the quantification of outputs and even of certain human inputs, is extremely difficult; and unlike those of an air force or space agency, most activities of education are multipurpose.

In spite of these great difficulties, program budgeting can make a major contribution to better planning of the education enterprise. As Alain C. Enthoven has stated:

'Ultimately, policy decisions will be based on judgements about relative values, the likelihood of certain future events, which risks we should and should not run, etc. But...good analysis can do a great deal to sharpen the issues, clarify the alternatives available to the decision-makers and narrow substantially the range of uncertainties, thus freeing the responsible officials to concentrate their attention on the crucial judgements.'"

APPENDIX C

FORMULA BUDGETING

1. The following are extracts from the Report of the Ontario Committee on University Affairs, 1967:

> "...Commencing in 1965, the Committee on University Affairs became concerned with the notion of formula financing and subsequently appointed a special sub-committee (A.N. Bourns, K.W. Taylor and D.T. Wright) which worked together with a corresponding subcommittee appointed by the Committee of Presidents (T.L. Batke, B. Trotter, and R.B. Willis), under the Chairmanship of D.T. Wright, to develop a policy for formula financing.
>
> The task assigned to the two subcommittees was to devise an objective procedure for distributing provincial operating grants to universities that would apply in the same fashion to all provincially assisted universities and which, hopefully, would need little or no adjustment, save compensation for increasing unit costs, for its effective operation over a period embracing several years at least.
>
> Many approaches could have been taken. On the one hand, and perhaps as an extreme, it would have been possible to establish faculty/student ratios; ratios of non-academic to academic staffs; average 'approved' salaries; average teaching loads; class sizes; numbers of research students per professor; and the like, faculty by faculty, along with similar norms for administrative functions, thus structuring an approved total level of expenditure which would necessarily be a function of the parameters established. Such a pattern would clearly have offended the nature of university autonomy, and would not have been in harmony with established practice in Ontario. Provincial grants have not, in general, been earmarked in the past, nor has there been any effort to establish line-by-line budget control. It would certainly not have been consistent with the sincere espousals of support from all quarters for effective university autonomy in Ontario to develop a new approach to financing which itself would be the agent for the erosion of autonomy.
>
> Through the efforts of the joint subcommittees it proved to be possible to establish a simple formula for determining operating grants on an objective basis as a function of (i) enrolments in various categories, (ii) weighting numbers reflecting average costs, faculty by faculty, and (iii) a dollar multiplier, or unit value, which, once fixed, could determine all grants and expenditures.* Formula income was defined to cover all costs of maintenance, book purchases for libraries, and all purchases of equipment (except initial equipping of new buildings), as well as ordinary costs of operation. Most importantly, this system, while acknowledging average levels of cost

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*Ontario Committee on University Affairs. Report to the Minister of University Affairs: A Formula for Operating Grants to Provincially Assisted Universities in Ontario (Toronto, Ontario Department of University Affairs, 1966) in different parts of the university, does not, in fact, constrain the apportioning of the university budget to various faculties and departments.

The formula proposal was completed towards the end of 1966 by the joint subcommittees and was approved in principle by the Committee of Presidents. It was recommended by the Committee on University Affairs for adoption and for first use in the determination of operating grants in the 1967-68 session. The unit value for 1967-68 was established as $1,320. Although the main task was completed the joint subcommittees were not disbanded but have pursued various follow-up work, including the development of necessary interpretations and definitions not fully detailed before, the consideration of formula amendments, and study of a possible general objective basis for extra-formula support for newer institutions that have not yet achieved a viable scale of operation.

The advantages claimed for the formula system are:

1. The resulting grants are demonstrably equitable.
2. University autonomy is clearly preserved.
3. Government is provided with a means of foreseeing and controlling, on a consistent basis, the general magnitude of university and college grants.
4. There is a maximum incentive for the universities to be efficient and to manage their affairs well; any notion that improvement inefficiency would lead to a corresponding reduction in support is offset. Long-range planning of university operations is greatly facilitated.
5. Rather than limiting initiative or imposing any 'dead hand of uniformity'*, the formula system gives freedom to the individual institution to order priorities and take necessary decisions.
6. Private donors are assured that gifts for operating purposes are an added resource to the university and not a substitute for public support.

Although experience with formula financing is still limited, it appears that most of the anticipated benefits are being realized. It is certainly clear that the advent of formula financing has stimulated great interest in the universities in resource allocation and in operational analysis, and the like. It is gratifying, as well, to note the interest shown in the Ontario formula by universities and granting agencies in other jurisdictions.

With the adoption of formula financing, it has become possible for the Committee on University Affairs to make important improvements in its annual review procedure. The formula obviates the need for detailed scrutiny of proposed expenditures in each university. Instead, the

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*See, for instance: Max Beloff, British Universities and the Public Purse, Minerva, v5,n4,pp 520-532 (Summer, 1967).

Committee has been able to concern itself more fully with the general character of university activity and development, with particular respect to the adequacy of current levels of support and their implications for such matters as the recruitment of academic staff, the provision of support for libraries and the equipping of laboratories. While the Committee still requires submissions of certain data on current financial outlays, the new pattern of concern is really more penetrating in terms of qualitative assessments than was ever possible with the budget review procedure previously followed.

The formula, as adopted, cannot provide completely for all requirements. Special extra-formula grants are required for the newer universities and colleges and for major new faculty developments until enrolments reach viable levels. Efforts are continuing to develop a supplement to the formula to provide for such needs. It is, of course, imperative that extra-formula support should be scrupulously limited and that, when granted, be provided for a fixed period only. For the future it will be essential to resist the pressing of special needs outside the formula except under extraordinary considerations. At the same time, it is to be expected that revisions will be necessary to the formula as more experience is gained."

"...Trends in Formula Unit Value

In preparing a recommendation for the value of the basic income unit for 1968-69, the Committee on University Affairs has had to consider not only ordinary inflationary pressures but, as well, the need to maintain academic salary levels on a competitive basis with those in other jurisdictions, the rapidly escalating costs and rates of obsolescence of library materials and laboratory equipment (both of which must be financed from formula income), as well as the general expenses of maintaining a very rapid rate of expansion of both undergraduate and graduate work in Ontario. The Committee on University Affairs feels that the development of new programs usually should be financed with ordinary formula income rather than from earmarked grants. But, of course, it must then be acknowledged that sufficient income has to be provided to permit necessary development. The Committee is considering all such factors and anticipates recommending that the value of the basic income unit for 1968-69 be fixed at $1,450, providing an increase of approximately 10 per cent from the $1,320 value of 1967-68.

Future trends are difficult to predict. The largest component of university expenditures is in salaries for academic staff. The academic market is international in scope; the ease with which new academic appointments can be filled in Ontario is directly related to such factors as economic conditions in Britain and the problems of the United States in Vietnam and at home. In recent years Ontario has benefited greatly by attracting from other countries large numbers of academic staff. Aside from such factors, there is some prospect for an easing of the academic market at junior levels - where most new appointments are made. During the past few years not only has enrolment increased rapidly but many new programs have been added, leading to a faster rate of accretion of staff than of students. As a result faculty/

student ratios have improved substantially in recent years. Such improvement will not continue indefinitely and the trend may even reverse with little or no loss in quality as students enrol to fill places in programs recently established. The flexibility provided by the formula, with free choice between new appointments, salary improvements and other types of expenditure will not impede such a trend. And the formula will not encourage further new program development except in areas where viable enrolment can be attained fairly quickly. Thus with enrolment growth continuing at about 10,000 a year rather fewer new appointments may be needed in the universities in the next five years than were needed in the last five years. Of course the total market for post-secondary academic staff will continue to increase rapidly with the extraordinary growth rate predicted for the new colleges of applied arts and technology. Fortunately, Ontario may be able to be less dependent on importation of academic staff because of the recent expansion of the Ontario graduate schools. For the universities, the greatest challenge will be to provide competitive salaries and conditions to retain able senior people in the face of raiding from the U.S. and from other parts of Canada. If the trends outlined here prove to be valid, university salary policies which have tended, with the pressure of new appointments, to show a fairly small difference between scale minima and average salaries can be expected to change to show greater variations."

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2. The following are extracts from the Report of the Ontario Committee on University Affairs, 1968-69:

"...The Formula in use

Continuing experience with the operating grants formula in use confirms the expectation that the benefits provided by such an objective device for testing aid and assigning resources would outweigh the disadvantages. The principal advantage of the formula is clearly in its implications as a planning device in rewarding good management and in promoting efficiency, improved productivity, and rationalization. From the point of view of Government, the formula can be used as a device either to allocate a fixed sum, alone, or to provide an objective measure for the determination of the absolute magnitude of total obligation. It is clear that the latter is preferable, but it does lead to a prospect of requirements for extra support if enrolment overruns expectations.

The change from the traditional 'add-on' style of budgeting, associated with line-by-line scrutiny of budget proposals is of critical importance. The 1968 meetings of the Committee with the individual universities indicated how, after only one year of actual experience with the formula (1967-68), internal budgeting procedures were changing. Senates and other academic bodies are assuming much more responsibility for resource allocation in the universities, and with this is coming more critical and realistic intra-institutional reviews of new program proposals. With the unit multiplier set for a given year and total resources determined by the formula rather than by the persuasiveness of university representatives at hearings with the Committee on University Affairs, the traditional relationship between faculty and administration also apparently has tended to change. Where, previously, the administration was seen as functioning to win support for ever-increasing academic aspirations, administrative officials and academic staffs now seem to be drawn together to wring the maximum benefit out of the resources allocated.

At the time the operating grants formula was being developed it was made clear and explicit that the formula weights should not constrain internal resource allocations. The Committee on University Affairs has been interested to note the different patterns of evolution in university budgeting which have resulted.

In some cases, universities have developed their own formulas for internal allocation, with weights different from those used to allocate resources amongst universities on a province wide basis. Such a development, acknowledging the special character of an institution, seems entirely appropriate.

There have been suggestions that program budgeting techniques should be adopted by the Committee on University Affairs. If this were done, it would necessarily lead to earmarked control of internal allocations to faculties, departments and individual programs in the universities. There could be no quicker route to the loss of autonomy and independence. The only basis for program budgeting for higher education on a province-wide basis is in terms of a 'program' interpreted on a macro basis. On the other hand, it seems clear that program budgeting could be applied with benefit within individual universities.

It is regrettable that some confusion has arisen obscuring the very important differences between the Ontario operating grants formula and so-called 'budget formulas' as used in a number of American states for financing universities and colleges. 'Formula budgeting' provides for the earmarking of budgets for many finely divided categories of expenditure according to more or less rigid standards (for class sizes, teaching loads, faculty/student ratios) which lead to homogenization and uniformity, with little opportunity for local discretion in resource allocation. 'Formula budgeting' has naturally come under considerable attack in the United States, and because of the similarity of terms, some of this criticism has been reflected on the Ontario system for formula grants. The two systems are, of course, profoundly different.

Increments in formula multiplier

The principal feature of the operating grants formula is that a single value, the multiplier, or 'basic income unit' as it has come to be called, determines not only the total Government grant but the grant for each institution, saving only for special extra-formula grants. In 1967-68, the value of the basic income unit was $1,320. For 1968-69, the value was set at $1,450, an increase of just under ten per cent. With close to four per cent inflation, there was thus a real increment of a little over five per cent in the total financial support available for the same unit of work. This was justified, at the time, by the fact that many items of university expenditure were increasing in unit cost more rapidly than indicated by the general consumer price indices. Beyond this, there was an obvious need to continue to provide increased resources for program development.

For 1968-69, operating support for the provincially assisted universities was initially estimated to cost $202,619,162, based on the income unit of $1,450 and an enrolment projection of 80,972 full time students. This enrolment projection reflected the combination of estimates of the individual universities, which was checked against grade 13 enrolment trends, and total enrolment projections for Ontario. Actual university enrolment in 1968-69 substantially overran projections in Ontario, as in most other parts of Canada. This in turn led to extra operating costs and grants, for provincially assisted universities, amounting to some $12.7 million.

It must be acknowledged that this experience emphasized the open-endedness of the formula grant mechanism in subjecting government to unanticipated expenditure. It can be argued on the one hand that this is an inevitable result of government policy to provide places for all those qualified and wishing to pursue university studies. On the other hand, such unanticipated costs are clearly unattractive and some devices for evading them or softening their impact may have to be found.

By the fall of 1968, when it came time to consider support for the fiscal year 1969-70, the financial climate had changed considerably. After considering the position of the universities and their requests for increased support in the light of the general economic situation, the Committee on University Affairs recommended an increment of 6.2 per cent in the value of the income unit, to $1,540, as part of a total program of operating support to cost $272 million. The Government, after review, indicated that $267 million could be provided. After further deliberation and a review of priorities, the Committee on University Affairs proposed that the income unit should be set at $1,530 for 1969-70. This provided an increment of 5.5 per cent from the year before, against an escalation in the consumer price index of 4.1 per cent over the same year in Ontario. The real increment in cost of a unit of work is thus small."

"...Extra-formula support for emerging universities

For the emerging universities, all the pressures for expansion and enrichment that are normally found in established universities are felt. Beyond this, small enrolment, inevitable in newer, small universities, necessarily leads to higher unit costs, yet, on the other hand, such newer universities are naturally eager to broaden their scope of activities.

It has been argued that the creation of new universities with unrestricted charters has endowed them with a right to develop any programs that they might feel appropriate for the development of the institution and its services to society - with a concomitant obligation on the part of Government and the taxpayer to provide the financial support for such development.

In a world without scarcity, such aspirations for intellectual accomplishment and service might all be realized. And it must be acknowledged that in recent years in Ontario it has seemed that financial support was a function of statements of aspirations. More recently it has become painfully clear that the pace of realization of aspirations must reflect a balancing of the availability of resources with assessment of need for particular development.

It follows from this that there has been a natural and unsurprising difference between the unfulfilled aspirations of the new universities as seen from within, and a reasonable pace of development for those institutions as seen from without. In specific terms the emerging universities in Ontario, compelled by their not inconsiderable aspirations, have requested very large annual increments in support over the past few years and have indicated no early diminution of need for extraordinary support. The Committee on University Affairs has each year in its annual recommendations proposed only such support for the emerging universities as would provide for what it felt to be a reasonable pace of development, in view of the needs of the province as seen in totality. As well, the share of the total university dollar that could be earmarked for the development of new institutions was considered in relation to the amount that must be provided for the continuing maintenance and rapid growth of the more mature universities.

Until the adoption of the operating grants formula in 1967-68, it was very difficult to assess the magnitude of extraordinary support being provided for the emerging universities, and in the institutions themselves there was an inevitable tendency to expect that the patterns of faculty/student ratios and high unit costs established in the early years would prevail almost indefinitely. With the adoption of the operating grants formula in the fiscal year 1967-68, it became possible to identify in quantitative terms an extra-formula increment measured simply as a percentage of total ordinary formula income."

"...In qualitative terms, the view of the Committee on University Affairs was that it would be unreasonable not to provide sufficient support to build the necessary foundation for the important role the new universities would have to carry in the future in the total system of higher education in Ontario. Support level should be sufficient to provide high academic quality. It was equally evident that a careful distinction must be made between extra costs due to 'emergence' (i.e. newness and smallness) and extra costs which would be inconsistent even with the operation of a mature, viable university. The Committee on University Affairs felt that extra support should be provided to meet the former costs, but that extra support should not be provided for the latter costs."

APPENDIX D

FORMULA BUDGETING (CAPITAL)

The following paper was prepared in September 1970 by Mr. J.D. McCullough, Director of Architectural Services for the Deputy Minister of University Affairs, Ontario.

"...INTERIM CAPITAL FORMULA

The Interim Capital Formula was devised by the Committee on University Affairs under the chairmanship of Dr. Douglas T. Wright in consultation with representatives of the Committee of Presidents of the Universities of Ontario and of the Department of University Affairs.

In the Province of Ontario it is the device whereby capital monies are allocated to universities to enable them to carry out building programs so that increasing enrolments may be accommodated. The formula is based upon enrolment projections. Recognizing that certain types of students require more space than others, the enrolment projections are weighted by course of study and year level. That is to say, various relative values are assigned to each student category based upon the type of program and the level at which the student is studying. A unit of space is then applied to each weighted unit of enrolment. Thus a Total Cumulative Space Need is determined for any particular year. From this Total Cumulative Space Need is subtracted the Existing Space in order to calculate the Additional Space Required. A unit cost is applied to the Additional Space Required and a cumulative dollar entitlement is calculated for any one year. This entitlement is based on the projected enrolment of the following year. The figure used for existing space - now referred to as Allocation Inventory - is fixed, that is to say, it does not increase as space is added. Instead, a charge to the entitlement amounting to the total cumulative amount of funds provided since the inception of the formula, is the only recognition of space having been added to the Inventory of any institution. Thus the incentive to raise outside funds for building purposes remains as does the incentive to build economically, since it stands to reason that if, for allocation purposes, the only record kept by the allocating body is one of cumulative cash flow, then it is in the best interests of the universities to build as much space for as little money as possible.

In order that such a formula be acceptable to all, it was necessary that agreement be reached on the values of the various inputs such as:-

(1) ENROLMENT PROJECTIONS

(2) ENROLMENT WEIGHTING

(3) SPACE PER WEIGHTED UNIT OF ENROLMENT

(4) THE ALLOCATION INVENTORY

(5) THE COST PER UNIT OF SPACE

In addition to the above parameters, the universities were concerned that consideration be given to:-

(1) AN ALLOWANCE FOR PART-TIME STUDENTS

(2) AN ALLOWANCE FOR TRI-MESTER STUDENTS

(3) THE AGE AND THE QUALITY OF INVENTORIES

(4) AN ALLOWANCE FOR SMALL SCALE OR EMERGENCE

These inputs were calculated as follows:-

(1) ENROLMENT PROJECTIONS

Five year projections by course of study and year level (graduate programs, etc.) are submitted by the universities to the Committee on University Affairs in the autumn of each year. The Committee reviews these projections both from the total provincial standpoint and from the individual institution's standpoint. In meetings with the university, the Committee comments as to the reasonableness of the projections and if it is decided that adjustments are necessary, they are subsequently made and revised figures are agreed to.

(2) ENROLMENT WEIGHTINGS

The Interim Capital Formula used weights which were arrived at by a committee of experienced administrator-academics from the Sub-Committee of the Committee on University Affairs and the Committee of Presidents of the Universities of Ontario. The weights concerned space only and were relative to each other. An attempt was made to keep the weightings simple and since the formula concerns the total assignable campus space, including dining halls, university centres, drill halls, etc. (but excluding residences and buildings for the Health Sciences), it was felt that the spread need not be great. The resultant weights ranged from 1.0 (Arts and Science Undergraduates) to 4.0 (Ph.D. in Science). There were three other weightings between these two extremes.

(3) SPACE PER WEIGHTED UNIT OF ENROLMENT

A survey was made of as many other jurisdictions as was possible in order to determine the average assignable area required for a full-time student in a four year, degree-granting institution. The most reasonable figure appeared to be 130 net assignable square feet. The enrolment projections were multiplied by this figure and the total provincial space requirement was determined for each year of the five year projections. Enrolments were then weighted and when the total provincial space requirement was divided by the total weighted enrolment, a space per weighted unit of enrolment was determined for each of the five year projections. On this basis a value of 96 net assignable square feet per weighted unit of enrolment was arrived at.

(4) ALLOCATION INVENTORY

In 1967 the consulting firm of Taylor, Lieberfeld and Heldman was retained to conduct a provincial space inventory and utilization survey, now known as the Ontario Universities Physical Resources Survey. Preliminary lists of all assignable areas of all buildings as of September, 1969, are now available for each university. These form the basis of the Allocation Inventory. To these totals are added the areas of the buildings under construction during the time of the survey and/or those which had been approved for financial assistance by this Department before April 1st, 1969 (the time when formula cash flows began to accumulate). The allocation inventory will only decrease in value because of scheduled allowed deletions; it can never increase and, if there are no deletions, will remain constant.

(5) COST PER UNIT OF SPACE

A net assignable square foot is the unit of space used in the Interim Capital Formula. The cost parameter allowed was calculated from a review of the unit costs of over 400 projects financed by this Department over the past 6 years and by similar review of the costs of commercial buildings and other building types. The unit cost is a project cost and as such includes an amount for professional fees, equipment, furnishings, and so on. The present allowance per net assignable square foot project cost is $55.00. This equates to approximately $28.00 per gross square foot building cost, based on the assumption that the assignable area amounts to 60% of the gross area and that approximately 20% of the unit cost is allowed for fees, contingency and equipment. All the above weightings and values constitute the input to the Interim Capital Formula used in the calculation of allocations of capital monies for the fiscal year 1969-70.

REVISED INTERIM CAPITAL FORMULA

For the fiscal year 1970-71 the Committee on University Affairs recommended that revisions to the formula be made to ameliorate the concerns of the universities as expressed on page three. The allowances recommended were as follows:-

(1) PART-TIME STUDENTS:

An allowance of 24 net assignable square feet for each equivalent part-time student, calculated by dividing the total number of courses taken by part-time students by six - to be added to the Total Space Required.

(2) TRI-MESTER STUDENTS:

An allowance of 12 net assignable square feet for each student enrolled in the spring-term to be added to the Total Space Required.

(3) AGE AND QUALITY OF THE INVENTORY:

A discount amounting to 30% of the area of buildings over 40 years of age (not having had a major renovation) to be allowed within the Allocation Inventory.

(4) EMERGENCE:

An allowance amounting to one half of the difference between the Total Space Need generated by the actual enrolment projection and that which would be generated by an enrolment of 4,500 weighted students to be allowed for developing or emerging institutions which are still operating on a small scale. This would allow for costs which are fixed regardless of the size of an institution.

USE OF THE FORMULA

ALLOCATIONS:

From the foregoing it can be seen that Cumulative Entitlements can be determined for any and all universities in the system for any one year up to five (or as many as have been projected). Thus, to allocate funds, the cumulative entitlement is determined - from this is subtracted formula funds already spent (since April 1st, 1969) and formula funds which are 'committed' (i.e. the university has an approval for the project from the Department and has shown a certain cash need until its completion). To the remainder is added an amount for 'non-formula' project needs and the total amount required for committed projects both formula and non-formula.

A further complication this past year was that a two year total need was determined and half was allocated in each of the two years. It can be seen that it may be that allocations might not be equal to entitlements if the size of commitments of non-formula and 'pre' formula projects are too great or if the total amount agreed to by the Treasury of the Province is too small. In either event, a capability of prorating the Total Space Required is essential in order to ensure an equitable distribution of available funds.

PLANNING:

Despite the fact noted above, the formula provides an almost perfect planning framework since it can be tabulated as a cumulative cash flow entitlement over a number of years. This enables an institution to time and size its projects to suit that cash flow.

ON-GOING ACTIVITIES AND OBJECTIVES

It will be noted that many of the values of the inputs have been arrived at in an almost arbitrary fashion. The reason they have been accepted (temporarily) is that the form of the formula allows for constant re-examination of these values and redress of any injustice. Because entitlement is cumulative and since space added is only recorded as a cash flow rather than as an addition to the inventory, an institution cannot suffer if a particular weighting or value appears to affect it adversely. If subsequent research discovers such an anomaly then the new value will produce a new cumulative entitlement; the university has not lost any allocation since all entitlements are cumulative.

It is quite likely that the universities and the Department of University Affairs will concern themselves for some time to come, examining ways and means of arriving at reasonable, defensible values for weighting space per weighted unit, cost of space and so on. The results of the study concerning utilization in the Ontario Universities Physical Resources Survey and the cost studies of this Department are to be combined in a sort of matrix in an attempt to get a more relevant weighting system which concerns student contact hours and the relative unit costs of space and equipment for different fields of study and year levels.

NON-FORMULA PROJECTS:

The inclusion of an allowance for buildings of 40 years of age or over allowed renovation projects to be placed in the category of 'formula' projects so that the only non-formula projects remaining are as follows:-

(1) Land Acquisition Projects

(2) Site Services Projects

(3) Utilities Projects

(4) Alteration Projects (over $25,000).

Since it is acknowledged that the allowance referred to above is arbitrary and token, research must continue for a proper age-quality discount.

AGE-QUALITY DISCOUNT AND CYCLICAL RENEWAL

It is most important that there be parity within the different various allocation inventories. It stands to reason that the space in a new university will be more useful, comfortable and functional than will that in one of some great age. The Ontario Universities Physical Resources Survey will furnish an age-quality profile of all inventories and it is hoped that some function of age and quality can be expressed as a percentage discount so that this parity can be achieved within the allocation inventories.

CYCLICAL RENEWAL

Perhaps the operative percentage amount referred to above would be the same or a function of the one required for cyclical renewal. This proposed additional allowance to the formula would insert an amount each year into the total cumulative entitlement which would cover the cost of alterations and allow for depreciation, obsolescence and eventual replacement.

It is likely that the cyclical renewal amount will be the total of a percentage of the allocation inventory, plus a percentage of the accumulated formula funds forwarded since the inception of the formula (April 1st, 1969).

In any event the form and the value of the percentage amount, together with the search for valid weightings and unit costs, constitute major ongoing tasks of this Branch."

After-note

Information received in June 1971 from the Ontario Department of University Affairs indicates that the following changes were introduced to the Interim Capital Formula for purposes of calculation of capital grants for the fiscal years 1971-72, 1972-73:

(1) Age-Quality Discount

A discount amounting to 1% per year of the age of a building was allowed within the various allocation inventories. That is to say, if a building is 50 years old, then the allocation inventory for that building is discounted by 50% of the real inventory. The total discount thus calculated was spread over five years from 1970-71 to 1975-76 because it increases entitlements to such a size that they could not be accommodated in any one fiscal year.

(2) Cyclical Renewal

An amount equal to the dollar equivalent (at $55 per net assignable square foot) of 1% of the allocation inventory, plus 1% of the cumulative cash flow since the beginning of the formula (April 1st, 1969), was added to the cumulative entitlement.

These two additions to the formula allowed renovation and alteration projects to be removed from the non-formula category and to be included in the formula category. Universities thus have the option of renovating a building, altering it or letting it remain as is and using these additional funds for the construction of a new facility.

CONNECT/CAMPUS SYSTEM

The following is an extract from a document prepared by the Systems Research Group of Toronto, 1970:

"...

DATA REQUIREMENTS

Type of Data:	CONNECT/CAMPUS
General:	The CAMPUS system is set up to accept a description of an institution at any level of aggregation as defined by the user. In its most detailed version it can simulate each individual activity, course or lecture on the campus or in an aggregate version summations of these into, for example, discipline categories.
Inventory Data:	CONNECT/CAMPUS is designed to accept inventories of staff, space and students as they presently exist in the institution at any level of detail specified by the user. i.e. staff and space can be broken down into as many subcategories as the user would like to examine or he can aggregate these depending on the availability of information and the type of analysis to be done.
Decision Policies:	CONNECT/CAMPUS accepts decision policies on academic and support staff, space management, expenditures allowances as direct inputs to the model.
Future Planning Information:	CAMPUS accepts future plans with regard to academic and administrative policy directly.
Historical Data:	CAMPUS can analyze historical data and use it as the basis for estimations for regression or time series projection techniques, or it can accept directly policy information.
Information in Operating Systems:	There are a series of analytical routines built into the CONNECT/CAMPUS system that allow it to analyze detailed information in operating systems that are used by the university to produce those input co-efficients that can be produced in this manner. This includes transfer and transformation of inventory information as well as estimating co-efficients and policies.

EASE OF USE FOR DIFFERENT TYPES OF INSTITUTIONAL PERSONNEL

Type of Institutional Staff:	CONNECT/CAMPUS:
General:	The complete documentation and operating procedures for CONNECT/CAMPUS are embodied in a computer assisted instruction program. This program literally allows the user who knows not only nothing about how to use the system, but also nothing about what the system can do to sit down at a terminal and carry out an interactive conversation with the computer to define whether or not there is anything in CONNECT/CAMPUS that can help him with his problem. If there is some capability, in terms of simulation or other kinds of analysis of data that can be of use, then the computer assisted instruction program will give the user a full set of instructions on how to perform the particular kind of analysis that he wants to perform. It will further check that he considers all the factors that have to be considered before analysis will be submitted. The CAI program will also aid him in the interpretation of the results of analyses and includes many hints with regard to the efficient preparation and analysis of experiments. Furthermore, all experiments numbering over 300 and including such things as changing the structure of the institution, the program being offered, the teaching methods, the administrative policies, etc., are called in by the user in English language instructions are given to the system and cause various computer routines to actually do the necessary modification to the data as instructed by the user.
The administrative analyst or non-systems and non-computer oriented person:	He is perfectly capable of sitting down and using the full CONNECT/CAMPUS system. Instructions such as increase enrolment by 2% in all Arts and Science programs for the years 1973 through 1975, produce program costing report on this case as versus the previous planned enrolment level, will generate all the necessary routines needed.

EXPERIMENTAL CAPABILITIES

The following is a partial list of CONNECT/CAMPUS experimental capabilities that can be generated using English Language commands.

TIMING, CALENDAR YEAR
TIMING, FISCAL YEAR
TIMING, LENGTH, TERM
TIMING, START TERM
TIMING, LENGTH, SIMULATION PERIOD
TIMING, LENGTH, CONTACT PERIOD
COST CENTER, CATEGORY
COST CENTER, LEVEL
COST CENTER, FUNCTION
COST CENTER, SUBFUNCTION

PROGRAM, CATEGORY
PROGRAM, SUBCATEGORY
PROGRAM, OWNERSHIP
PROGRAM, DURATION
PROGRAM, CREDITS

REVENUE, OBJECT, CATEGORY
REVENUE, OBJECT, SUBCATEGORY

REVENUE, CATEGORY

REVENUE, SUBCATEGORY
REVENUE, FUNCTION

ACTIVITY, SCHEDULE, DAY OR NIGHT
ACTIVITY, SCHEDULE, PERIODS PER MEETING
ACTIVITY, SCHEDULE, MEETINGS PER WEEK
ACTIVITY, SCHEDULE, DURATION

ACTIVITY, CLASS SIZE, MINIMUM
ACTIVITY, SECTION SIZE, DESIRED
ACTIVITY, GROUP SIZE, MAXIMUM

EQUIPMENT, TYPE
EQUIPMENT, CAPITAL COST
EQUIPMENT, OPERATING COST

EQUIPMENT, DEPRECIATION RATE
EQUIPMENT, OBJECT, CATEGORY
EQUIPMENT, OBJECT, SUBCATEGORY
EQUIPMENT, INVENTORY
EQUIPMENT, COST, VALUE
EQUIPMENT, FUNCTION

CLASSROOM, SIZE, POLICY
LABORATORY, SIZE, POLICY

CLASSROOM, TEACHING WEEK, POLICY
CLASSROOM, SCHEDULE, POLICY
CLASSROOM, MANIPULATION, POLICY
LABORATORY, TEACHING WEEK, POLICY
LABORATORY, SCHEDULE, POLICY
LABORATORY, MANIPULATION, POLICY

CLASSROOM, CONSTRUCTION COST
CLASSROOM, COMPATIBILITY
CLASSROOM, SIZE
CLASSROOM, AREA

CLASSROOM, EQUIPMENT, ATTRIBUTE
CLASSROOM, EQUIPMENT FUNCTION

CLASSROOM, INVENTORY, SIZE
CLASSROOM, INVENTORY, ROOM

LABORATORY, CONSTRUCTION COST
LABORATORY, COMPATIBILITY
LABORATORY, SIZE
LABORATORY, AREA

LABORATORY, EQUIPMENT, ATTRIBUTE
LABORATORY, EQUIPMENT, FUNCTION

LABORATORY, INVENTORY, SIZE
LABORATORY, INVENTORY, ROOM

OFFICE, CONSTRUCTION COST

OFFICE, INVENTORY, CAPACITY
OFFICE, INVENTORY, AREA
OFFICE, FUNCTION

SUPPORT SPACE, CONSTRUCTION COST

SUPPORT SPACE, EQUIPMENT, ATTRIBUTE
SUPPORT SPACE, EQUIPMENT, FUNCTION

SUPPORT SPACE, INVENTORY, CAPACITY
SUPPORT SPACE, INVENTORY, AREA
SUPPORT SPACE, FUNCTION

ACADEMIC STAFF, OBJECT, CATEGORY
ACADEMIC STAFF, OBJECT, SUBCATEGORY

ACADEMIC STAFF, INITIAL, INVENTORY
ACADEMIC STAFF, STAFFING UNITS
ACADEMIC STAFF, CONTRACT LENGTH
ACADEMIC STAFF, SALARY
ACADEMIC STAFF, OFFICE
ACADEMIC STAFF, PROMOTION, TRANSITION
ACADEMIC STAFF, LEAVE, TRANSITION
ACADEMIC STAFF, HIRING ALLOWED
ACADEMIC STAFF, MINIMUM, HIRE
ACADEMIC STAFF, MAXIMUM, HIRE
ACADEMIC STAFF, MINIMUM, DISTRIBUTION
ACADEMIC STAFF, MAXIMUM, DISTRIBUTION

ACADEMIC STAFF, OPTIMIZATION, POLICY
ACADEMIC STAFF, NON-TEACHING, POLICY
ACADEMIC STAFF, INVENTORY, POLICY
ACADEMIC STAFF, UPDATE POLICY

ACADEMIC STAFF, TEACHING, STAFFING UNITS

ACADEMIC STAFF, NON-TEACHING, STAFF REQUIRED

ACADEMIC STAFF, NON-TEACHING, FUNCTION

NON-ACADEMIC STAFF, OBJECT, CATEGORY
NON-ACADEMIC STAFF, OBJECT, SUBCATEGORY

NON-ACADEMIC STAFF, SALARY
NON-ACADEMIC STAFF, UPDATE
NON-ACADEMIC STAFF, OFFICE
NON-ACADEMIC STAFF, FUNCTION

OTHER RESOURCE, OBJECT, CATEGORY
OTHER RESOURCE, OBJECT, SUBCATEGORY

OTHER RESOURCE, FUNCTION

ACTIVITY, RESOURCE, TYPE CATEGORY
ACTIVITY, RESOURCE, OWNERSHIP SUBCATEGORY
ACTIVITY, RESOURCE, SIZE
ACTIVITY, RESOURCE, FUNCTION

ACTIVITY, CATEGORY
ACTIVITY, TYPE
ACTIVITY, DISCIPLINE
ACTIVITY, SUCCESS FACTOR
ACTIVITY, CREDITS
ACTIVITY, SCHEDULE
ACTIVITY, SECTION SIZE
ACTIVITY, LOCATION
ACTIVITY, RESOURCE COMBINATION
ACTIVITY, COMBINED

ACTIVITY, ELECTIVE WEIGHT

CURRICULUM, ACTIVITY, PARTICIPATION
CURRICULUM, ELECTIVE, PARTICIPATION

CURRICULUM, LENGTH
CURRICULUM, START

STUDENT PROGRAM, PARTICIPATION

STUDENT, INITIAL, INVENTORY

STUDENT, FRESHMEN, ENROLMENT

STUDENT, TOTAL ENROLMENT

STUDENT, PROGRAM, DISTRIBUTION

STUDENT, ADVANCED ENTRANTS

STUDENT, TRANSITION, PASS
STUDENT, TRANSITION, REPEAT
STUDENT, TRANSITION, DROPOUT

STUDENT, TRANSITION, RANGE
STUDENT, TRANSFER RATE

STUDENT, CREDIT, LOAD
STUDENT, CREDIT, PARTICIPATION

STUDENT, CREDIT, RANGE

TECHNICAL STRUCTURE OF THE MODELS

Feature:	CONNECT/CAMPUS:
Organization structure:	User defined - departmental - degree program - budget - discipline July 1970
Parameters/Variables	Completely flexible - any resource classification structure - any student classification - structured by college according to needs
Academic staff requirements:	- direct buildup of contact hours in activities/sections - actual staffing policies - conversion to number of staff - staff/student ratio is an output
Teaching space requirements:	- direct buildup - by detailed types and classifications - space/student is an output
Other resources:	- direct activity buildup or - estimated functions
Capability to analyze innovation:	- direct changes in structure values

Experimentation:	CONNECT/CAMPUS:
System capabilities:	- oriented towards actual administrative academic policies - one to one relationship between policies and parameters - can therefore identify parameter/policy relationship
Experiment mode:	- verbal dialogue with administrator - no computer expertise July 1969 - interactive editing July 1970
Experiment level:	- complete flexibility - from individual course to college level 1967

Reporting:	CONNECT/CAMPUS:
Reporting format:	- report generator - user specified - no reprogramming July 1970
Report types:	- tabular - 1966 - graphical - 1966
Reporting level:	Complete flexibility - from individual course to college level 1966

ANCILLIARY ANALYSES AVAILABLE

Type:	CONNECT/CAMPUS:
Formula financing analysis	yes
Affinity analysis on space requirements	yes
Detailed capital cost estimation	yes
L.P. analysis of the economic timing of new construction	yes
Regression analysis and exponential smoothing of simulation results for long range projection	yes
Analysis of the economics of space conversion	yes
Selected analysis of simulation results to search for a set of desired conditions	yes

Various Ways of Looking at the Problems That Can be Analyzed by CONNECT/CAMPUS

Sample Problems:

By Time Horizon

1. Short Term:
   - a. What changes in class size, teaching load and facilities allocation can be made to accommodate the shift in student selection patterns that seems to be coming about based on registrations to date?
   - b. What three plans can we undertake to cut back our operating budget by 10% as dictated to us by the Division of the Budget, with the least impact on the quality and scope of our program?
2. Long Term:
   - a. What would be the impact on operating and capital budgets if campuses further specialize in high cost programs so that excessive duplication were eliminated?
   - b. Assuming no change in current policy, when must tuition increase and by what amount?

By Organizational Level

1. SUNY Central Administration:
   - a. If tuition is increased across the board, progressively, over a period of years, or selectively by student level or type, what happens to SUNY capacity to expand student enrolment, facilities and program offerings?

b. What effect will changes in instructional contact hours per FTE have on the capital program and operating costs?

2. Individual Campuses:

a. What will be the impact on operating and capital budgets of specializing one campus of the University in computer-assisted instruction?

b. What are the costs of starting a new environmental sciences program at campus 1 versus campus 2 versus campus 3?

By Level of Detail

1. Summary:

a. What will be the impact of cost escalation and interest rate escalation on the total operating and capital budgets in SUNY over the next ten years?

b. What will be the impact on total operating and capital budgets of a shift in the commuter resident mix of 25% more resident students?

2. Detailed:

a. What would be the overall campus and department by department impact of a decrease in class size of 25% for all activities involving 25 students or fewer, or an increase of 50% in class size for all activities involving 26 students or more?

b. What is the detailed list of spaces by type and size needed by campus X under their new revised academic program and enrolment goals?

By Resource Type

1. Space:

a. Under present plans and programs and for any alternative to it, where, in detail, is excess space in the system, what is its character, what can it be used for?

b. Estimate the impact on surpluses and shortages as well as percent utilization of different kinds of space at different future times of an increase in the length of the teaching week of 10% and an increase in scheduling efficiency due to better scheduling of 15%?

2. Staff:

a. What would be the average workload, number of staff members and number of new hirings needed by discipline, by campus over the next five years for our present plan, and compare that to the situation if no new programs are added?

b. What change in staff complement would be required to accommodate a simultaneous 25% decrease in class size and 25% increase in workload?

3. Capital Budget:
   - a. What would be the impact of incorporating the rehabilitation program in total or in part into the regular state program and forcing the use of bond money for its financing on a short and long range capital program?
   - b. What would be the impact on capital costs if there were a change in construction practice that made it possible to put up a structure in twelve months rather than eighteen?
4. Operating Budget:
   - a. What would be the impact on the total operating budget of SUNY of incorporating Brooklyn Polytech into the system on a full integration basis?
   - b. What would be the impact on the cost per student by level and type of program, the cost of disciplines by level and type, and the degree cost of a reorganization of the system that involves making general courses available at every campus and specializing campuses in professional degree programs?
5. Revenue:
   - a. What happens when tuition changes (across the board, selectively by program level) to income and capital construction program?
   - b. By comparing the cost and revenue under selective possible changes in tuition as well as under present conditions, what kinds of academic programs yield or cost the greatest number of net dollars on particular campuses and on a university-wide basis?

By Problem Type

1. Organization:
   - a. What would be the comparative operating budgets and space requirements over the next five years of holding the present size of XXX campus at its present size and creating a new site five miles from the old one?
     This problem should be analysed from the point of view of three major alternatives with regard to the programs to be offered at the new site.
   - b. What changes, if any, in space requirements would be brought about by eliminating the dedication of space to particular colleges or schools within a campus and creating a campus-wide pool?
2. Enrolment:
   - a. Under a given set of program offerings, what are the economies of scale in operating and capital budgets for various levels of enrolment?

b. Given the major sources of uncertainty with regard to the course selection pattern for students for next year, what policies in terms of restricted course offerings, class sizes and teacher selection could be made to maximize the adaptability of campus YYY?

3. Academic Decisions:
   a. What is the impact on operating and capital budgets of adding 1, 2 and 3 new programs per year per campus over the next five years?
   b. What will a move towards individualized instruction and self-paced learning mean for campus ZZZ over the next five years?

4. Administrative Policy:
   a. What will be the impact on resources if the university policy with regard to support staff is changed?
   b. What will be the impact on operating budgets of a change at campuses B1 and B2 to a quarterly system?

5. General Policy
   a. What would be the relative economics of developing a new four-year college as against offering all of its programs at the three institutions that surround the new site that is being considered?
   b. What would be the impact on capital budgets of changing the space planning factors?

6. Environmental Factors:
   a. What would be the impact on staff workloads and/or class sizes if 15% of the staff needed in academic discipline A1 cannot be hired over the next five years?
   b. What would be the impact on the operating budgets for each of the campuses and for the entire system of three levels of inflation rates for each of staff salaries, supply purchases and utility costs?

By Type and Problem Analysis

1. Direct:
   a. What is the impact on operating budgets, recruitment load, need for office space, etc., of a 10% decrease in class size combined with a 9% increase in staff workload and an 8% per year average salary increase to the faculty? These types of changes can be made directly by posing the question in a form not far removed from the way it has been posed above. The model takes care of all necessary computations to make the changes and to produce the results.

2. Interpretation: a. What is the cost of introducing a new environmental sciences program at campus XX for next year and the four years following?

   This type of problem cannot be posed directly, but rather some interpretation is needed. In particular, the activities involved in this program have to be specified, along with the kinds of resources they will use, estimates of student enrolment have to be obtained, etc. Once these specifics have been laid out, then they can be put directly into the model. The only way of simplifying this type of problem is if one can relate the type of changes that you would like to make to some other similar set of circumstances in the system. i.e. the new environmental sciences program used on this campus is going to be like the ecological planning course given at campus Z1, in this case the information describing the program to which the new one is similar can be transferred directly to the model and evaluated on that basis. This capability becomes more important as more institutions use the system and thus a greater range of possibilities is represented already.

3. Inference: a. What would be the impact of an open enrolment policy? With this type of problem it is not merely a matter of interpreting the question, but rather of understanding the inferences of what is being said. What are the implications of open enrolment in terms of a number of students and their course selection patterns, their success rates, etc. Once these second level implications have been determined, then one can proceed to become more specific through an interpretation mode and move to the point where one has a direct question that can be put into the system for evaluation."

APPENDIX F

CONNECT/CAMPUS REPORTS

An illustration of the reports needed with the Connect/Campus System is given in quotations below from a document prepared in 1970 by Dr. H.W. Jackson, Director of the Applied Arts and Technology Branch of the Ontario Department of Education:

"... REPORTS TO BE CALLED FOR THROUGH THE CONNECT/CAMPUS SYSTEM

A. INTRODUCTION

Initial reports produced through our new information system will begin to emerge in November and December of 1970. The period will be a time of system explanation, education of college personnel, and shaking down of data bases. The culmination of the intitial phase will be January 1971, when the colleges will be called on by the department to produce specific 1970-76 plans through use of the model -- for Treasury Board's planning requirements. Guidelines for this work will be issued in December or around New Years.

The series of reports being contemplated is decribed below. It falls into two classes: (1) management reports dealing with the current situation in the recent past, and (2) planning reports dealing with future resource needs.

All these reports are concerned essentially with the economics of educating students, and the characteristics and school work of their students -- and what they do when they leave college. All such questions are very important these days, as education comes under ever-closer scrutiny by the public and its representatives.

B. MANAGEMENT REPORTS

The most urgent need for management reports through CONNECT/CAMPUS focuses on the backgrounds and activities of students and staff, and the kinds and uses of space at each college. (Detailed application of the model for cost analysis of a short-term or historical type will be developed later).

1. Student Reports

By November 1, we should be receiving a series of reports from the colleges on postsecondary students. These reports, which include almost all of DBS's reporting needs (and save the colleges this chore), have been defined by the department as described below. The data concerned must be centrally accessible through our Toronto terminal from your data files:

By Campus, Total by College

1. Number of full-time students, by sex and by Ontario secondary school attended (including designation of county and municipality), with college area segregated.

2. Number of full-time students, by sex and by province or country of last educational experience (including Ontario).

3. Number of full-time students, by program subcategory and by province or country of last educational experience.

4. Number of full-time students by program subcategory and by region (groups of countries) of last educational experience.

5. Number of full-time students, by sex, from educational institutions within and outside the college area.

6. Number of full-time students, by sex and by father's and mother's educational level.

7. Numbers of students by sex, by program, and by academic years, full-time and part-time, and total.

8. Number of full-time students by program subcategory (technology, business, applied arts, health, other) and country of citizenship.

9. Number of full-time and part-time students, by sex and by program.

10. Number of full-time and part-time students by age, by sex, by academic year, and by program subcategory.

11. Number of full-time students by program subcategory, by sex, and by activity last year (same school, full-time at school, employed or seeking work, other).

2. Staff Reports

At present the college system generates very little information on college staff members. Having agreed to help DBS meet its Ontario requirements for college staff data, the department feels the time is opportune to develop the ISF staff file. Not only will DBS be able to get its data, but future annual surveys will be made much easier for all concerned.

College staff members are pioneering in Ontario post-secondary education in most college centers. The legislature and the public are interested in their number characteristics and work. Individual colleges will also be interested in trading information.

DBS has agreed to do most of its own file processing from our ISF data. The following reports are a sample of the kind the department will be looking for towards the end of November:

By Campus (if relevant), by College

1. Number of staff in each category (teaching, academic officers and staff, support staff, administrative staff, plant staff, ancillary services staff) and subcategory (within these), with average salary for each category and subcategory.

2. Number staff by category and by country.

3. Age and sex distribution of teaching staff and academic officers, under M and F headings, the number of these people in the following age groups (excluding subcategory 2.09):

   Under 25
   25 - 35
   36 - 45
   45 - 60
   Over 60

4. Number of degrees or other qualifications of teaching staff and academic officers by the standard educational list (Items 19, 22, 25, 31, 34, 37, 40). Comparison with total number of staff.

5. The number of degrees by province and country, regardless of level. Comparison with total number of staff.

6. Number of teaching staff and academic officers by language ability.

7. Average number of years of teaching experience (45, 46, 47, 48, 50) for all teaching staff and academic officers.

8. Average number of years of non-teaching experience (51, 52, 53) for all teaching staff and academic officers.

3. Space Reports

The ISF system generates reports on rooms and other components of the college's total enclosed space in buildings. As a background for this information, ODE compiles manual records on key characteristics of the buildings and other facilities constructed at the various stages in the colleges' growth.

This is the series of space reports to be called for in the fall and winter of 1970:

By College from ODE Sources

1. From departmental records, and confirmed by college authorities, total annual capital expenditure and cumulative totals, for the years 1966-70 (excludes renovations).

2. From departmental records, and confirmed by college authorities, total annual renovation expenditure, and cumulative totals for the years 1966-70.

3. From departmental records, and confirmed by college authorities, total annual rentals of facilities and cumulative totals, for the years 1966-70.

By College from CONNECT/CAMPUS

4. Current total number of square feet, by square feet per category and per cent of total represented by each category.

5. Square feet per enrollee, at the college as a whole and for each space category.

Back-up from CONNECT/CAMPUS

If needed, the following back-up data will be called up:

- Room listing by college by category
- Aggregation by category at each campus of each college
- Aggregation by category and subcategory at each campus of each college (with college supplying its own key for subcategory codes).

C. PLANNING REPORTS - THE SIMULATOR AND HOW IT WILL GENERATE VARIOUS KINDS OF REPORTS FOR LONG-RANGE PLANNING

1. The Simulation Model

The simulation model adapted for the Colleges of Applied Arts and Technology is capable of emulating the operations of any one of the colleges from the current year to any date in the future. For operational purposes, the system is set up to cover up to a nine year planning horizon.

The model operates by reading in a "data base" which describes a college's current situation. This data completely describes the organizational, academic and financial structure of the college. Thus the simulation model itself is neutral or free of any numerical relationships. The data itself specifies the actual relationships or structure of the college according to a college's own data base.

The model then simulates the actual operations of a college over one year, turning out student loads and resource requirements. A series of output files are created and stored before the simulation model moves on to the next year.

At any point in time a college can specify changes in academic and administrative content or structure and the model then simulates college operations under changed conditions for the next year turning out output files.

Once a simulation run is complete (the simulator has covered the specified number of years) the files are stored and a user can then request that reports be created from these files and printed on his terminal or at the computer installation and mailed.

Once a college has arrived at an acceptable multi-year plan or plans the college can request that the output from these plans be placed on a special file which can be accessed by the Department of Education. This output is stored with that of the other colleges in the system and the Department of Education can then request reports comparing or aggregating results from all or a select series of colleges.

2. How the Simulator Works (Fig. 1)

Although the simulation model is complex from a software or computer programming point of view, the actual simulation process is rather simple. This is due to the fact that the simulator contains no complex mathematical equations or relationships but merely mathematically emulates the physcial process embodied in a college. Figure 1 briefly describes the main steps followed by the simulator over a planning cycle.

The left side of the diagram sets out the main input data requirements. The middle portion describes the basic simulation steps. The right side lists the output focus of these steps:

1) Input describing numbers of students already in the system, new entrants, program distributions of these new entrants and transition rates are fed into the student section of the model. The model then calculates enrolment at academic achievement levels eithin individual programs.

2) This program enrolment is then merged with input data describing program curricula or lists of courses taken by student in programs, participation rates and detailed descriptions of each course. The model then calculates the number of course students at each achievement level of each program and the student contact hours for each program and each course in the Institution.

3) The model then reads in teaching staff and space policies, salaries and inventories for each teaching or instructional cost center. This information combined with student and resource contact hour loads on the teaching cost center is used to calculate requirements for teaching staff, space and equipment for instructional cost centers.

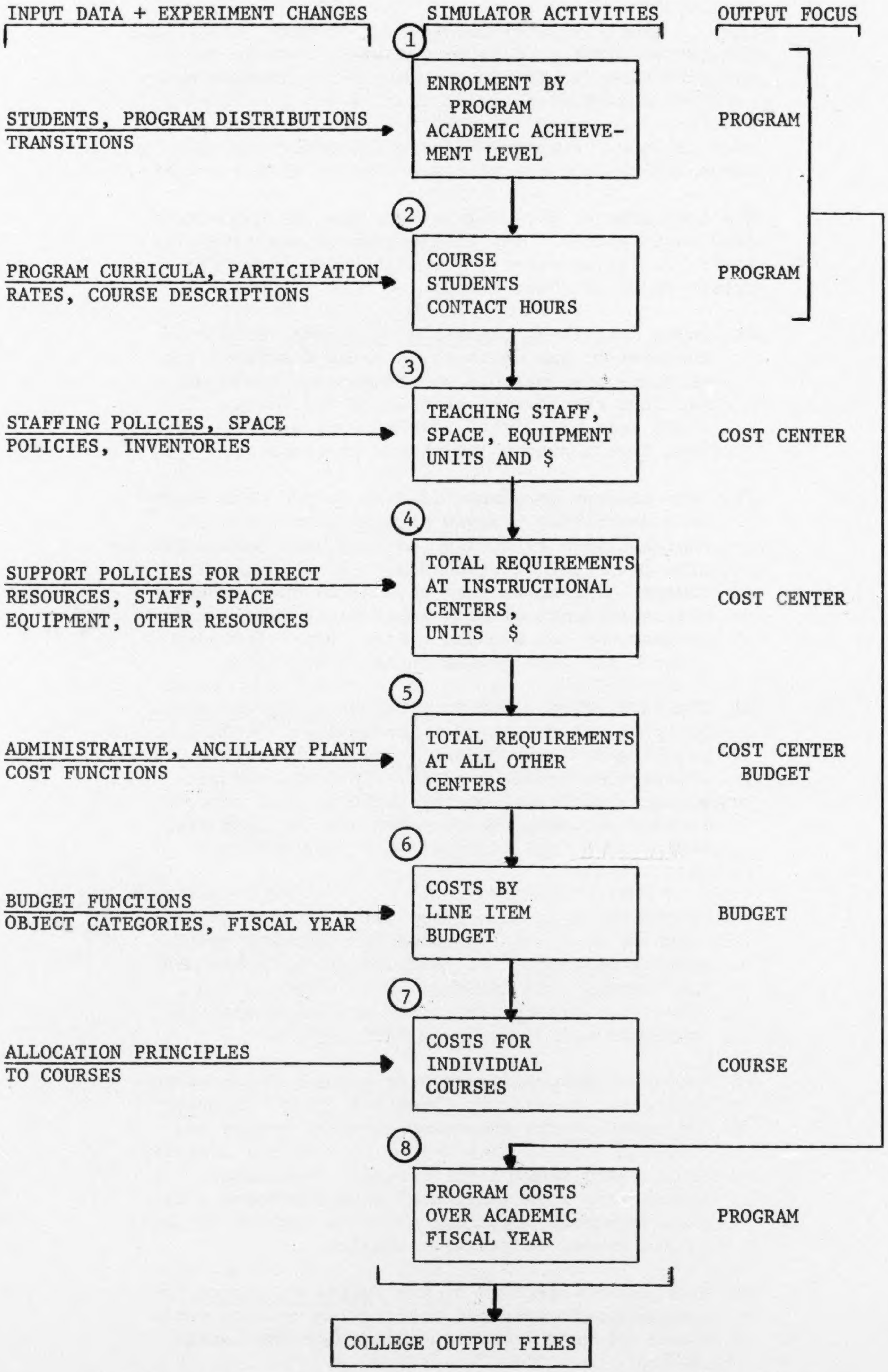
4) Functions or relationships are then read in which describe costs and policies for calculation of support resources for teaching staff, space and equipment. This information is added to the direct costs and total costs are calculated for instructional or teaching cost center.

5) Functions describing relationships between administrative, ancillary, plant and other "indirect" cost centers are then read into the system and resource requirements are calculated for administrative and other cost centers. Descriptors translating from individual organizational entities to budget functions are then applied to calculate fiscal budget requirements.

6) Detailed information on the budget structure is combined with previous information to turn out a total detailed line item budget for the total college.

FIGURE 1

CAATS SIMULATION MODEL


INPUT DATA + EXPERIMENT CHANGES
SIMULATOR ACTIVITIES
OUTPUT FOCUS
①
ENROLMENT BY PROGRAM ACADEMIC ACHIEVEMENT LEVEL
STUDENTS, PROGRAM DISTRIBUTIONS TRANSITIONS
PROGRAM
②
COURSE STUDENTS CONTACT HOURS
PROGRAM CURRICULA, PARTICIPATION RATES, COURSE DESCRIPTIONS
PROGRAM
③
TEACHING STAFF, SPACE, EQUIPMENT UNITS AND $
STAFFING POLICIES, SPACE POLICIES, INVENTORIES
COST CENTER
④
TOTAL REQUIREMENTS AT INSTRUCTIONAL CENTERS, UNITS $
SUPPORT POLICIES FOR DIRECT RESOURCES, STAFF, SPACE EQUIPMENT, OTHER RESOURCES
COST CENTER
⑤
TOTAL REQUIREMENTS AT ALL OTHER CENTERS
ADMINISTRATIVE, ANCILLARY PLANT COST FUNCTIONS
COST CENTER BUDGET
⑥
COSTS BY LINE ITEM BUDGET
BUDGET FUNCTIONS OBJECT CATEGORIES, FISCAL YEAR
BUDGET
⑦
COSTS FOR INDIVIDUAL COURSES
ALLOCATION PRINCIPLES TO COURSES
COURSE
⑧
PROGRAM COSTS OVER ACADEMIC FISCAL YEAR
PROGRAM
COLLEGE OUTPUT FILES

7) Information from steps one, two and three is applied to total costs along with allocation principles to allocate both direct (teaching)costs and indirect costs to individual courses.

8) Program course information from steps one and two is combined with individual course costs to calculate program costs over both academic years and fiscal years.

The final and intermediate information is written into an information system or set of files catalogued by an individual college's code. This information is then available for assembly into reports as specified by the college.

This process is repeated for each simulation period or year as requested by the user. If the simulation run is to be submitted to the Department as a provincial submission, the summary output information is aggregated by standard categories and transferred to a Department file.

3. How the Interactive Prompter Works

The interactive prompter is the heart of the CONNECT/CAMPUS (CAATS)[2] system. All communication between a college or departmental user and the system takes place using this program. The interactive prompter is a conversational assistance and instruction package which enables non computer oriented personnel to communicate with the CONNECT/CAMPUS system.

Besides providing communications with the planning and ISF analytical system, the prompter contains step-by-step instructions on how to use the system. It describes the system's capabilities and limitations. A college user who is familiar with his college organization and data base will be able to converse with the prompter and perform analyses and receive reports.

Each college will have a series of security clearances which will allow only cleared persons to access data and perform analyses for their own college. The security structure is hierarchical and is composed of four levels:

1) A signon code.

2) The college name which must match 1.

3) The user's name which must match 1 and 2.

4) A personal security code which must match 1, 2, and 3, and provides selective access to parts of the system.

Thus one user may be cleared to access and use the planning system and all the ISF analytical capabilities while another user may be cleared only for one system (i.e. physical plant manager for the space system).

4. Planning Report Capability

Planning reports refer to projected student loads and resource requirements. The simulation model will be capable of reporting over a time span covering projected current year costs to nine years in the future. The simulation model is capable of turning out an enormous bulk of information; to make this information more digestible, we have sectioned this output at two main levels.

(a) Individual College Output Information

This is planning information which is turned out from the simulation model for individual colleges and broached in terms compatible with an individual college's structure and reporting needs. Thus college reports are structured to cover actual programs, cost centers and resource definitions as set out by the college.

The reports are arranged in a hierarchical structure ranging from detailed one-period contact hour reports to multi-year resource summaries.

(b) Provincial Submissions (Fig. 2)

The information gleaned from individual college information systems and deposited for access by the Department of Education must be aggregated by standard categories if the Department is to be capable of compiling cross college reports. Thus our first task was to build a standard set of categories into the simulation model over which information would be stored. This set of categories will probably undergo modification over the next several months but it is tentatively part of the system now.

The actual information passed from individual college information systems to the centralized system is set out in Figure 2.

FIGURE 2

CONNECT/CAMPUS (CAATS)^2 PROJECT

SUMMARY OF CENTRALIZED PLANNING INFORMATION

1. OPERATING COSTS
BY COST CENTRE CATEGORY
BY YEAR/TERM
BY RESOURCE TYPE (STAFF, SPACE, EQUIPMENT, OTHER RESOURCES)
BY RESOURCE CATEGORY
BY BUDGET FUNCTIONS

2. ENROLMENT

ENROLMENT) (BY PROGRAM CATEGORY/SUB-CATEGORY
STUDENT CONTACT HOURS) (BY YEAR/TERM
STUDENT COURSES) (BY STUDENT CATEGORY
NUMBER OF PROGRAMS)

3. PROGRAM COSTS

TEACHING STAFF COSTS) (BY PROGRAM CATEGORY/SUB-CATEGORY
OTHER COSTS) (BY YEAR/TERM
ANCILLARY PROGRAM COSTS) (BY STUDENT CATEGORY
TEACHING SPACE)
SUPPORT SPACE)

4. STAFF

TEACHING STAFF) (BY COST CENTRE CATEGORY
    NUMBER) (BY YEAR/TERM
    SALARY) (BY STAFF CATEGORY
    CONTACT HOURS)
NON TEACHING)
    NUMBER)
    SALARY)

5. SPACE REQUIREMENTS

TEACHING SPACE) (BY COST CENTRE CATEGORY
    CONTACT HOURS) (BY YEAR/TERM
    ROOMS) (BY SPACE CATEGORY
    SQUARE FEET)
    STATIONS)
    UTILIZATION)
    OCCUPANCY)

SUPPORT SPACE)
    SQUARE FEET)
    STATIONS)

6. COURSE COSTS

ENROLMENT) (BY COST CENTRE CATEGORY
STUDENT COURSE HOURS) (BY COURSE TYPE
COURSE HOURS)
STAFF HOURS)